THE AMERICAN GAS LIGHT JOURNAL

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXXIX. No. 10. Whole No. 1,474. | NEW YORK, MONDAY, SEPTEMBER 7, 1903. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, New York.

Telephone.—2996 John.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $5 (£1—25 francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Briefly Told 361
Notes.

Present Tendencies in Some Machine Tool Demands 362

Eleventh Annual Meeting, Pacific Coast Gas Association—Report of Proceedings 362
First Day, Morning Session - Routine Business—Reports of Secretary and Treasurer—Report of Board of Directors—Election of New Members—Report of Library Committee—President's Address—Amending the Constitution and By-Laws.

*The Testing of Coal Tar and Oils and an Improved Testing Still, by Mr. W. H. Jayne 364

*Something about Natural Gas in Islands of the Southern Seas, by "An Exile" 364

Unaccounted for Gas, by Mr. John Patterson 366

*The Diesel Oil Engine for Central Station Work 367

Proposed Municipal Ownership of Electric Lighting Plant, Cleveland, O. 368

*The Smith Tapping Machine 368

Petroleum in California, by Mr. Edmond O'Neill 369

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 372
Changes in Staff Positions—A Correction—The Coke Ovens at Sparrows Point, Md.—Mr. F. Lewis Goes to Portsmouth, N. H.—Bond Issue, Louisville (Ky.) Company—The Buffalo, N. Y., Meter Charge Case—Bond Issue, San Francisco Company—The Belfast (Me.) Lighting Plants Change Hands—Cheapet Gas for Westminster, Md.—Considering the Gas Supply of Reading, Mass.—Personal—And Many Other Items.

The Market for Gas Securities 374

BRIEFLY TOLD.

NOTES.—

THERE may be a bigger blowhard occupying a high seat in a mayoralty chair in Massachusetts than Mayor Flanders, of Haverhill; but if that is so, many would like to know the city there which holds the distinction. Perhaps "blowhard" is not up to his positive title, but in either event it looks that Haverhill would be better off if Flanders were in power in some other place. Some time ago a concern, without house or home in Haverhill, bid for the public lighting of that busy city, in so far as such illumination was done by means of electric lamps. The local electric company, in an appeal to the State Board of Gas and Electric Light Commissioners, stated the case, and the Board very promptly decided that, having heard all the parties concerned (and here is the meat of the case in a nutshell), "The effect of the testimony as a whole * * * was practically an admission by the new company that its offer would be unprofitable [to itself]. Under these conditions it becomes important to consider what will be the probable results to the city as a whole from the admission of a second company, which has no superior advantages in equipment or managerial experience, which is practically silent as to plans about its commercial lighting, and which seeks admission solely upon the ground of its willingness to supply street lighting at an unprofitable price." The full text of the decision may be found in our issue dated August 3d last, p. 173. However, the Mayor, who, by-the-way, was always supported in this opposition scheme by the Board of Aldermen, has been nursing his wrath to keep it in the best condition of heat, and now boldly asks for the cutting out of all, or "nearly all," of the arc electric lights in Haverhill—presumably he would like to have "a few" retained in and near his home and his place of business (provided the Mayoralty is his only mainstay at present from such a point of view)—and to substitute therefor naphtha lights of "an improved type." We do not know how much better or worse off the inhabitants of Haverhill would be from or by such substitution; but it does seem that the sound of his proposition is like unto that of the braying of an ass.

THE shareholders of the Walla Walla (Wash.) Gas and Electric Company have assented to the action of the executive officers in disposing of the Company's properties and rights to Mr. Isaac W. Anderson and associates, whose offer for such purchase was noted in the JOURNAL. The new owners were to have taken active charge of the properties the 1st inst., and they "are promising" to expend $250,000 in betterments on the manufacturing and distributing divisions of their purchase.

WE have received from Messrs. Lindsay & Co., of Chicago, a copy of their new catalogue, which naturally sets forth in as handsome style as good type, excellent illustrations, perfectly understandable text, sensible binding and the like can possibly do, the merits of the specialties that they are offering to the trade. The Company is also issuing with the catalogue a "special gas company price sheet," and a well lithographed sheet, for show purposes on room walls, store windows and the like. As the Lindsay Company said in its forwarding of this matter to us, "Any mention of this may bring requests for the inclosures from those we have unintentionally overlooked, although we have tried to see to it that everyone in the gas industry was sent a copy." The address of Lindsay & Co. is 170 Lake street, Chicago.

LIBRARY OF CONGRESS
SEP 8 1903
SMITHSONIAN DEPOSIT.

THE Pennsylvania Globe Gas Light Company has, in response to the asking of the authorities of Philadelphia for bids for the maintenance of the naphtha lamps employed in the public lighting of that city, offered to perform the work on the following basis: For each lamp up to 20 candle power, $21 per lamp per annum; 60-candle power lamps to cost $29.50 each. The figures do not differ from those hitherto prevailing.

THE Monterey (Cal.) Gas and Electric Company has just concluded a most satisfactory series of demonstration lectures on the virtues and economies of the uses of gas for cooking purposes. The demonstratress was Miss A. C. Roach, of San Francisco.

THE residents of Exposition Park, Dallas, Tex., are very anxious that the Dallas Gas and Fuel Company should extend its mains in that direction, but the Company hesitates, knowing as it does that the district in question is pretty well covered as to some of its parts with growing timber.

THE latest people to secure a gas franchise in Guthrie, O. T., are Messrs. Johnson & Gillette. It is possible that the grantees mean business.

IT is said that there are 79 gas works in operation in Spain, of which 20 are placed in the province of Barcelona. The total output of gas for 1901 is returned at 5,621,000,000 cubic feet, the tax on which, in the form of royalties to State and local authorities, amounted to $396,000. The average selling rate is $2.85 per 1,000.

THE proprietors of the Columbia (N. C.) Gas Light Company have decided not to accept the proposition made for that property by the Columbia Electric Street Railway, Light and Power Company. President Apperson, of the Gas Company, has authorized Supt. Daniels to put the plant in first-class shape.

THE Stacey Mfg. Company will construct a holder for the Corona (Cal.) Gas and Electric Company. It is to be of steel and is to rest in a *wooden* tank. Mr. A. F. Le Gaye, Secretary of the Company, says that they propose to give Corona all the gas service that its residents may demand.

THE Laclede Gas Light Company, of St. Louis, Mo., has declared a semi-annual dividend of 2 per cent. on the common stock. It is payable September 15th.

MR. ARTHUR L. ZWISLER, of Kalamazoo, Mich., Joseph Barton and D. C. Merrill have purchased the Big Rapids (Mich.) gas plant and will reconstruct the same. The new name of the concern is the Big Rapids Gas Light and Coke Company.

Present Tendencies in Some Machine Tool Demands.

Iron Age notes that recent inquiries received by machine tool builders indicate that the limits of the demands made by users of steels for high power machines have not yet been reached. One concern asks for a lathe warranted to take a chip 1 inch deep, with a feed of ¼ inch, at a speed of 130 to 150 feet per minute. Machine tool men, appreciating the difficulty that would arise in designing a drive that would meet these requirements, and also in providing a method of supporting the work under the tremendous strains that would be set up, look askance at the proposition, and each prefers to have some one else make the experiment. An experienced builder, commenting on some recently placed orders, expresses the opinion that the demand for rapid change multi-feed engine lathes will soon reach a limit, and tend to decrease rather than increase.

In specializing work many manufacturers are striving to put it out of the power of the workman to exercise his judgment in the matter of feeds. This is illustrated in the case of one manufacturer, who placed an order for 8 engine lathes of the same capacity. The specification was that only 3 feeds should be obtainable on a lathe; that the feed should be arranged so that it could not be changed without some trouble to the workman, and that each of the 8 lathes should have its 3 feeds distinct from each of the other 7. The manufacturer had figured closely the maximum work that a man could get out of a lathe on his special task, and the intention was to compel the workman to maintain the feed determined for him; in other words, to take the matter of judgment out of the shop and keep it in the drafting room. He maintained that by having the feeds of each lathe distinct and independent of all the others, he would be better able to keep track of each machine's production. This would certainly be true in a plant the character of whose output would permit the employment of each of these lathes on work for which it was best suited. In this case each lathe would merely resolve itself into a special tool, designed and used for one particular job and not adapted, because of its limited range, to the economical production of any other work.

Such a plan could not be introduced with advantage in a small shop having a widely varied line of parts. Nevertheless, the regulating of the speed of tools, both spindle speed and feed, is becoming a question of greater responsibility for the shop foreman each year. The desire to keep the rapid change multi-feed lathe out of the reach of the workman is apt to grow, but we do not believe it will extend except along the lines indicated above.

ELEVENTH ANNUAL MEETING, PACIFIC COAST GAS ASSOCIATION.

HELD IN SAN FRANCISCO, CAL., JULY 21-23, 1903.

FIRST DAY—MORNING SESSION.

The Eleventh Annual Meeting of the Pacific Coast Gas Association was called to order by the President (Mr. M. C. Osborn), at 10:40 A.M., Tuesday, July 21, 1903.

ROUTINE BUSINESS.

On motion of Mr. Britton, the formal roll call and the reading of the minutes of the session of 1902 were dispensed with.

The reports of the Secretary and Treasurer, Mr. J. B. Grimwood, were then read. On motion of Mr. Britton, these were unanimously adopted.

The report presented by the Directors was as follows:

To the Members of the Pacific Coast Gas Association: We, the undersigned Directors of the Pacific Coast Gas Association for the year 1902-1903, beg leave to report that we have examined the books and vouchers of the Secretary and Treasurer for the above mentioned year, and approve the same as correct. Proper vouchers are on hand for all disbursements, and receipts have been properly posted, the balance of cash on hand, as of July 1st, 1903, being $801.40.

The following papers have been submitted, which we approve and hereby authorize for presentation at this our 11th annual meeting:

President's Address; by Mr. M. C. Osborn, San Francisco, Cal.

"Liquid Air: Its Application to the Gas Industry;" by Prof. G. A. Bobrick, Los Angeles, Cal.

"High Pressure Gas Distribution;" by Mr. John A. Britton, Oakland, Cal.

"Our Customers and their Complaints;" by Mr. D. Decker, Santa Rosa, Cal.

"The Oil Industry of California from a Commercial Standpoint;" by Dr. C. T. Deane, San Francisco, Cal.

"Wrought Iron:" by Mr. Franklin Riffle, San Francisco, Cal.

"Practical Protection of Metal Surfaces in Gas Plants;" by Mr. L. P. Lowe, San Francisco, Cal.

"Peak Loads in the Gas Business;" by Mr. J. B. Grimwood, San Francisco, Cal.

We recommend the following for election to membership in the Pacific Coast Gas Association:

Active.

Philo Jones, Supt. Salinas (Cal.) Water, Light and Power Company.

Henry L. Doherty, Engr. Denver (Col.) Gas and Electric Company.

J. W. Morton, Dunham, Carrigan & Hayden Company, San Francisco, Cal.

F. A. Leach, Jr., Accountant, Oakland (Cal.) Gas Light and Heat Company.

Robt. J. Thompson, Welsbach Company, San Francisco, Cal.

A. J. P. Matthiesen, Welsbach Company, San Francisco, Cal.

John Klepper, Supt., Phœnix (Ariz.) Gas Company.

Thos. W. Brooks, National Tube Company, San Erancisco, Cal.

Franklin Riffle, Dunham, Carrigan & Hayden Company, San Francisco, Cal.

R. M. Adams, Secy., Los Angeles (Cal.) Lighting Company.

Roderick McKay, Supt. Mfr., Los Angeles (Cal.) Lighting Company.

H M. Corlette, Asst. Gen. Mgr., Los Angles (Cal.) Lighting Company.

W. J. Dorr, Supt. Dist. Dept., Los Angeles (Cal.) Lighting Company.

Herman Weber, Mgr., Petaluma (Cal.) Gas and Electric Company.

Fred. A. Rasch, Portland (Ore.) Gas Company.

A. Ross, Independent Gas and Power Company, San Francisco, Cal.

W. E. Osborn, Mgr., Woodland (Cal.) Gas and Electric Company.

C. W. Conlisk, Secy., Cal. Gas and Electric Corporation, San Francisco, Cal.

J. E. Poingdestre, Mgr., Grass Valley Div., Nevada County Gas and Electric Company, Grass Valley, Cal.

Associate.

United Gas and Electric Company, San Jose, Cal. (No representative named.)

Suburban Electric Light Company, San Leandro, Cal. (No representative named.)

The Walla Walla Gas and Electric Company, Walla Walla, Wash. (No representative named.)

Spokane (Wash.) Gas Company: (1.) I.W. Anderson, Vice-President; (2.) ——; (3.) ——; (4.) ——.

Stockton (Cal.) Gas and Electric Company. (No representative named.)

Chico (Cal.) Gas and Electric Company, J. L. Hoke, representative.

Colusa (Cal.) Gas and Electric Company, J. D. Kuster, representative.

Grass Valley Division. Nevada County Gas and Electric Company, J. E. Poingdestre, representative.

Nevada City Division, Nevada County Gas and Electric Company, John Werry, representative.

Petaluma (Cal.) Gas and Electric Company, H. Weber, representative.

San Rafael (Cal.) Gas and Electric Light Company, F. E. Fitzpatrick, representative.

Woodland (Cal.) Gas and Electric Company, W. E. Osborn, representative.

San Louis Gas Company, San Louis Obispo, Cal, E. S. Hoyt and Robt. N. Frick, representatives.

San Francisco (Cal.) Gas and Electric Company, S. Russell, Thos. Finn, Chas. L. Barrett, Allan Pollak, representatives.

Whatcom County (Wash.) Railway and Light Company. (No representative named.)

(Signed,) JOHN A. BRITTON, R. P. VALENTINE, W. A. ALDRICH, C. O. G. MILLER, M. C. OSBORN, } Directors.

On motion of Mr. Lowe it was adopted.

The Report of the Library Committee was read as follows by the Secretary (in the absence of Mr. E. C. Jones, Committee Chairman).

To the President and Members of the Pacific Coast Gas Association: Your Library Committee begs to report as follows: The work of your Committee during the past year has been in the nature of missionary work to get money to provide books and to urge our members to read them. In both, when compared with the work of the Library Committees of other Associations, we feel encouraged, because there have been frequent calls for books and inquiries for reference on special subjects during the year which tend to show that the Library fills a need.

It is not necessary to report the number of books taken from the Library, but it suffices to say that the Library has been generously used during the past year, and that as it increases in value it will be more used. During the year it was found necessary to issue a complete catalogue of books, a copy of which is attached, and which it is hoped affords the members an opportunity to avail themselves of the valuable information contained in our collection of books.

Following is a statement of the receipts and disbursements for the past year:

Receipts.

Balance on hand March 1st, 1903, as per report of March 4th, 1903	$146.35
April 3d, 1903, Spokane Falls Gas Light Company	25.00
June 11, 1903, the W. F. Boardman Company	100.00
	$271.35

Disbursements.

March 6, 1903, Yawman & Erbe Mfg. Co.	$1.90	
" 21, 1903, Philadelphia Book Co	7.20	
" 30, 1903, " "	3.50	
April 7, 1903, " "	3.40	
" 15, 1903, Commercial Publishing Co	16.00	
May 6, 1903, E. R. Waite, Nat. Oilmen's Assn.	5.00	
June 2, 1903, Armstrong & De Guerre	9.40	
" 11, 1903, Philadelphia Book Co	1.40	
" 29, 1903, Yawman & Erbe Mfg. Co	1.20	$49.00
Balance on hand, July 1st, 1903		$222.35

A short time ago, Mr. W. F. Boardman, representing the Schneider & Trenkamp Company, the Standard Lighting Company, the General Gas Lighting Company, and Messrs. Lindsay & Co., donated $100 (being $25 from each of the concerns named) for the purchase of books to be presented to the Library, and it was the express wish of Mr. Boardman that the Chairman of the Library Committee should purchase certain books on the subjects of petroleum, gas engines, steam engineering and engineers' handbooks, amounting to the above sum. These books have been carefully selected and are now on their way from the East, and it is hoped they will arrive before the annual meeting of the Association, in order that they may become a part of the Library and be open for the inspection of our members We now have a creditable collection of books, and it is hoped that the members will avail themselves of the opportunity to use them freely.

To the contributors above noted is due the thanks of the Association and its individual members for this generous contribution.

Your Committee wishes to call your attention to the fact that the formation of several libraries in connection with the various Gas Associations in this country and abroad has caused a demand for books which were considered obsolete and almost valueless, and hence has brough them into demand, that it becomes necessary for us to secure these books for our Library as soon as possible while they may be procured at reasonable prices. The Committee, therefore, urges the members of the Association to contribute as liberally as possible to the library fund, in order that the plans of the Committee may be carried out, and that our Library may be worthy of our Association. It should also be understood that any money spent on books pertaining to our business is an excellent investment, as most of the books are becoming rare and are increasing in value.

The Association is indebted to Mr. J. B. Grimwood for the design and contribution of a book plate, which is an artistic reminder to all of us that the books should be promptly returned to the bookcase of the Association after they have been used.

Your Committee is glad to say that the Library and the Library funds are in good condition and to express a feeling of satisfaction in having performed a work during the past year which has been productive of some good and much appreciation. Respectfully submitted,

(Signed), E. C. JONES, Chairman, GEO. C. HOLBERTON, L. P. LOWE, } Committee.

On motion of Mr. Britton the report was ordered received and placed on file.

The President—The next business before the Association is the election of new members.

Mr. Britton—I take it that, as the Board of Directors in its report has already recommended the election of these members, they are now virtually elected, and no other action of the Association is necessary, unless there should be some objection to some one of the members, or to any or all of them, and the Association should desire to elect individually.

On motion of Mr. Lowe the Secretary cast the ballot of the Association announcing the election to active membership of those proposed in the report of the Directors.

PRESIDENT'S ADDRESS.

Vice-President Aldrich assumed the chair, and the Association listened to the reading of President Osborn's address.

[For the text of President Osborn's address, see JOURNAL, Aug. 17, p. 242.]

The Vice-President appointed Messrs. L. P. Lowe, J. W. Thomas and Frank A. Cressey, a committee to consider the address and report their findings thereon later on.

AMENDING THE CONSTITUTION AND BY-LAWS.

The President in announcing that the next business would be the considering of the amendments to the Constitution and By-laws, said: Perhaps, without any preliminary discussion, it would be best to have the Secretary read the amendments. The question will then be open for discussion. The amendment was then read by the Secretary, as follows:

Resolved, That Article III. of the Constitution be amended by inserting, after Clause 1, the following: "Corporations, companies, firms or individuals engaged in the business of manufacture or sale of gas shall be eligible as associate members of the Association, and as such entitled to all the privileges of active membership, excepting that of voting or holding office.

Resolved, That Article V., Section 1, of the by laws be amended to read as follows:

"* * * The fees for active membership shall be $5, and the yearly dues shall be $5, payable annually thereafter. For associate membership there shall be no fee, and the dues shall be $5 per annum for each membership taken by each associate member or representative. The number of representatives allowed to each associate member shall be limited to 4."

The President—The amendment is now open for discussion. As Mr. Britton introduced this resolution at our last meeting it will probably be best for him to explain to the Association its exact purpose.

Mr. Britton—I think the matter was very fully covered at the last session and all the reasons given why we should have an associate membership. I do not think it necessary to enlarge further upon the matter at this time; and I, therefore, move you that the resolution be adopted as read. [Adopted.]

Mr. Britton—I now move you that the Secretary be instructed to cast the ballot of the Association for the applicants for associate membership as read in the report and adopted by the Directors. [Adopted.]

[To be Continued.]

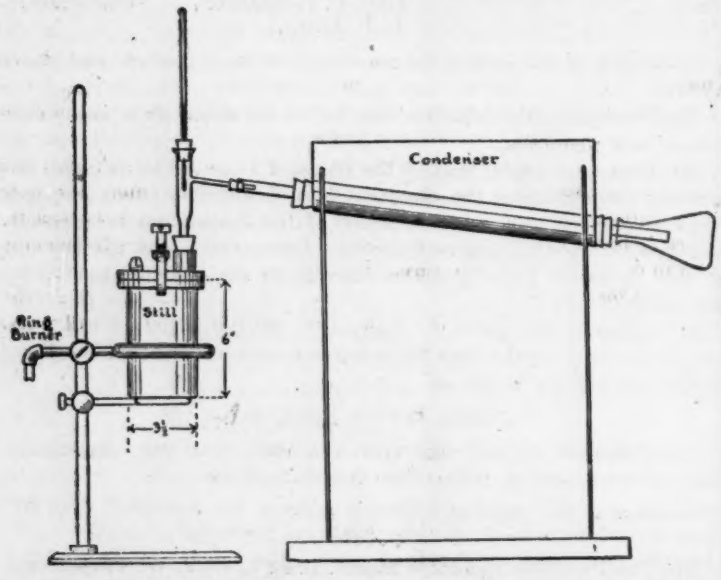
The Testing of Coal Tar and Oils and an Improved Testing Still.

By Mr. H. W. Jayne, in *Jour. Am. Chem Soc.*

In the examination of coal tars and oils, and in determining the per cent. of water they contain, it is necessary to distil a considerable quantity of material, from 500 to 1,000 cc. at least. In treatises on this subject it is usual to recommend the use of glass retorts of several liters capacity. As the temperature in making a complete test often rises to 400° C., and as water is usually present, the risk of breakage is very great; and when the distillation is finished, it is impossible to remove the pitch or residue completely.

In our laboratory, where hundreds of these tests are made every year, we found it necessary to substitute a metal still, and, in the course of time, improvements have been suggested by the different chemists making these tests, until a form of still and condenser has been adopted, which will be found convenient for those engaged in this line of work.

The still is of heavy copper with straight sides so that it can be easily and thoroughly cleaned. The upper edge is surrounded with a heavy



turned ring. The lid is of brass, and is clamped to the still by a single clamp passing over the top, a paper gasket being placed between the two metal surfaces. The condenser consists of a copper trough open at the top, through which passes a glass tube 24 inches long. This form of condenser is particularly advantageous for tar distillations. It is filled with water at the beginning of the test, and this is sufficient to condense all the lighter portions. When the fractions containing naphthaline begin to distil, they are liable to choke the tube by the crystallizing of this body. To prevent this, a burner is placed under the trough and the water warmed to any degree required. When still higher temperatures are reached, where water cannot be used owing to danger of cracking the tube, it can be readily drawn off by the small cock.

In cases where it is necessary to distil very volatile liquids, pieces of ice or a freezing mixture may be placed in the trough.

For oil testing, the long Liebig condenser is not advantageous; it is difficult to clean; and on account of its length, considerable material adheres to the sides. As all tests of oils, naphthas and benzenes are run slowly, so that the distillate flows from the condenser in single drops, a long tube and flowing water are unnecessary.

One filling of water will suffice for many tests of benzenes or oils. If, however, flowing water is needed, the condenser is fitted with connections for tubing.

For water determinations, a small still is used of a capacity of 1,000 cc., sufficient for distilling 500 cc. of tar. For complete tests of tars, especially if the light oils are to be examined, 1,000 cc. should be used, and the still has a total capacity of 2,000 cc.

For water determinations, great care must be taken in collecting the sample. If the shipment is made in bulk, a small cock should be placed in the pipe line from the car or boat to the tanks, and a small stream allowed to flow during the entire pumping. The quantity so collected should be violently stirred, and at once filled into wide-mouthed quart bottles or cans before any separation can take place; 500 cc. of this sample are filled into the still, the lid securely clamped, and the tube and thermometer put in place. If heat is applied to the bottom of the still, great care must be used, as the contents will readily foam and boil over if much water is present; this is especially true of tars containing much free carbon along with water, and also of certain oil tars in which the water forms an emulsion.

To avoid this, a ring burner is provided which surrounds the still, and is at first placed so that the heat strikes about the top of the tar in the still. Little attention need be given the distillation, but from time to time the ring burner is lowered, until finally nearly all the water is driven out, when, if necessary, an additional burner is placed under the bottom.

In order to be certain that all water is expelled, the temperature of the thermometer in the vapor should reach 200° C. As the distillation proceeds, oil comes over with the water until at 200° a considerable quantity of the former has distilled. The volume of the water is then read off in cubic centimeters, and gives the volume per cent., on which all these tests are based.

If, after the water has heen determined, it is desired to examine the tar or oil further, the oil which has distilled over with the water is carefully separated from the latter and added to the cooled tar in the still, and the distillation recommenced; thus, the subsequent determination will be based on dry tar. Unless this is done, false results are obtained, due to the oils distilling at lower temperatures in the presence of vapor of water. For example, a tar, which, if dry, would show 5 per cent. distilling under 200° C., might show 20 per cent. to the same point if much water was present.

The ring burner may be dispensed with during this latter distillation, and it is advisable to cover the still with a sheet of asbestos, if a high temperature is to be finally reached.

If at any time it is desired to examine the material in the still, this can be done without dismounting the apparatus by removing the small plug in the lid and introducing a rod. The pitch or residue can be tested as to the melting point or other properties, and if not of the desired test, the distillation can be continued.

Some tars are exceedingly difficult to free from water, the contents of the still boiling over notwithstanding all precautions. If it is desired to determine only the water in these, the removal of the latter can be greatly facilitated by adding to the tar a hydrocarbon, boiling slightly higher than water—crude or refined toluene, for instance. This thins the tar, and as it distils readily, carries over the water completely. Distillations which otherwise would require hours to complete, can be then readily made in 20 minutes.

This method is also very advantageous for determining water in naphthaline or oils rich in this substance, as it facilitates the driving out of the last traces of water, and prevents crystallizing of the naphthaline in the condenser tube and receiver, and permits the volume of water to be readily read off.

In these determinations a pure product need not be used—any hydrocarbon boiling between 100° and 200° will serve, the precaution being taken, however, to determine how much water it contains, and allowing for the same.

Recently a German patent, No. 130,295, was granted for determining water in substances by adding a higher boiling liquid than water and one that does not mix with it. It is to be regretted that these simple laboratory methods should be made the subjects of patents, and it is difficult to understand the object of taking such a patent; but in this case it would be invalid in the United States, as the method has been used for a long time at different works.

Something About Natural Gas in Islands of the Southern Seas.

By "An Exile."

Natural Gas Found with Petroleum Deposits.—Natural gas is found in connection with petroleum and salt water deposits in the islands of the Philippines, Guam, and vicinity of Borneo. Since 1840 natural gases have projected from borings of petroleum wells, as is known to the fraternity. It was in the oil well drilling processes in West Virginia in the '40's that the oil engineers first met with volumes of gases coming out of the drilled holes of the oil depositories. Since that time natural gases from oil and salt water deposits have been frequently obtained. Since the earliest development of the oil fields in Pennsylvania, for example, the engineers have always managed to secure sufficient gases to operate engine plants while working for oil; but in nearly all of the oil fields of the country, and including those of this portion of the world, the promoters of the works were seeking oil only and the gases were permitted to go to waste, except such portions as were needed to heat certain boilers for running pumps or other mechanical devices requiring power. Soon, however, there came a time when the storing of gas and the transportation of same to desired

Prospectors' Camp.

points through pipes was instituted. This was the beginning of the natural gas era. Millions of cubic feet of gas had escaped the oil well drillers before they took means to save the gas. First standpipes were erected and these were lighted by the burning gas drawn from the wells, and the gas was so plentiful that the gas was permitted to burn day and night. In 1875 there began the processes of gas economy for purposes of heating boilers in glass and other works, and a few years later the engineers commenced putting in pipe systems for taking gas from the wells to cities for lighting purposes and for fuel.

In Foreign Lands.—In the islands of the Southern Pacific in which your correspondent is travelling, the oil well people have made a start almost from the beginning to utilize the gases, benefiting from the experiences of the American oil and gas well engineers. Here the natural

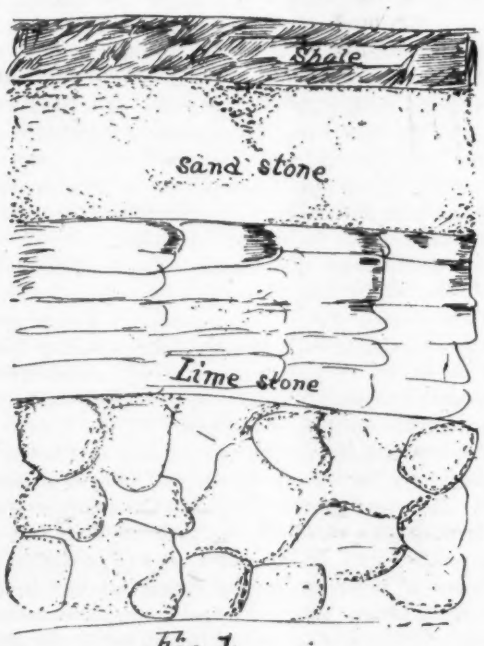


Fig. 1.

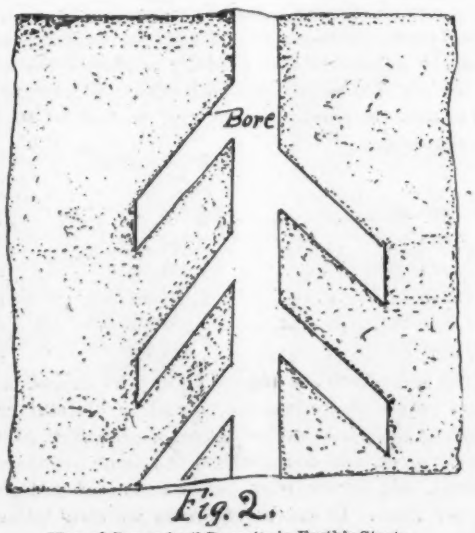


Fig. 2.

Plan of Gas and Oil Deposits in Earth's Strata.

gas is found in sandstone deposits and in limestone formations at depths ranging from 40 to 50 feet, to as many as 1,000 or more feet. Wells are usually sunken by the oil well boring process, and usually with the intent of striking oil. Sometimes the yield is chiefly gas. The strata formation is shown in Fig. 1. The natives are employed to do most of the work and often sub-wells are dug by them. The native workers are secured for 10 to 30 cents per day. Some of the natives are capable and can be taught to operate drilling rigs. In Fig. 2 is exhibited the peculiar type of digging often resorted to when the native drillers desire to reach out into the strata of earth on all sides to tap any oil or gas chambers that may prevail. Considerable cutting and shovelling can be counted on to get the branches extended from the main bore, but these wiley natives are capable of cutting their way through narrow passages and squirming almost everywhere they desire to go. The result is that the engineers can reach considerable area of ground.

Derricks.—The native mode of derrick construction is employed, a view of which is given in Fig. 3. The pieces forming the derrick are bamboo, as a rule, except, perhaps, the legs. These, if the derrick is small, are bamboo, but if large are made of cocoanut trees. After the poles for the corners are erected, they are braced by means of the numerous cross-pieces of bamboo. It is seldom that the natives use nails or even wood pegs to secure the connections. They lap pieces of split material or grass ends or tough pieces of bark in strands about the union of the poles and in this way get a firm bite. It is seldom that the derricks fall to pieces. I saw some settled quite over, but all the joints remained intact. The boring rig is put up inside the center, just as in the regulation derrick of American oil well drilling engineers, and the work of boring proceeds, irregularly and slowly, but with effectiveness, and in course of time the desired bores are made.

Pipe Connections.—Metal and other pipes and joints are, of course, limited in supply in this part of the world, and in fact are hardly ever available. The native workmen are equal to the occasion, and in Fig. 4

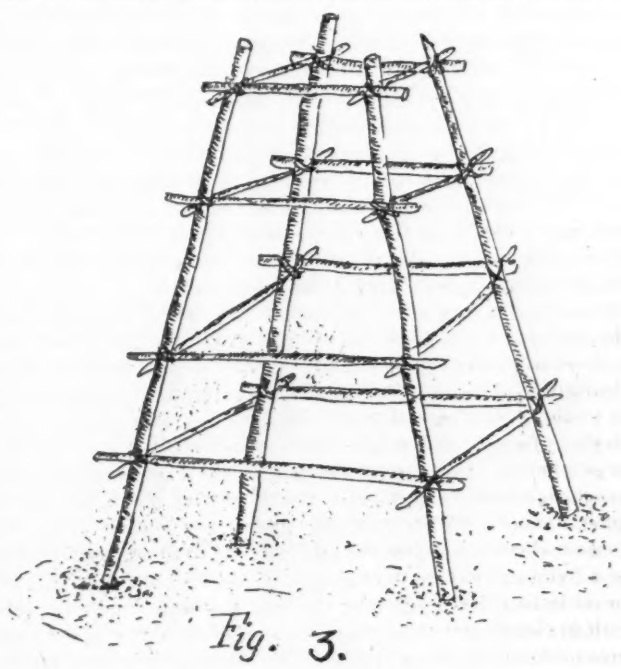


Fig. 3.

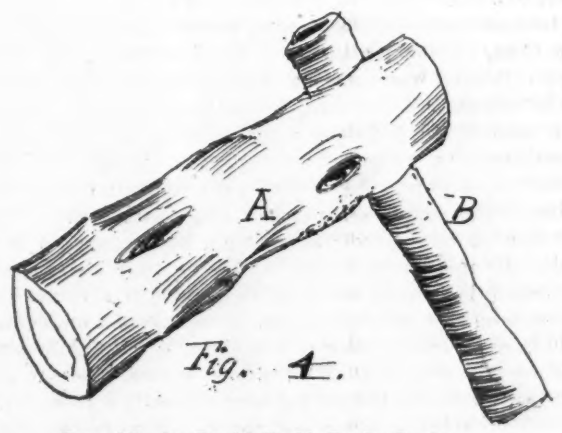
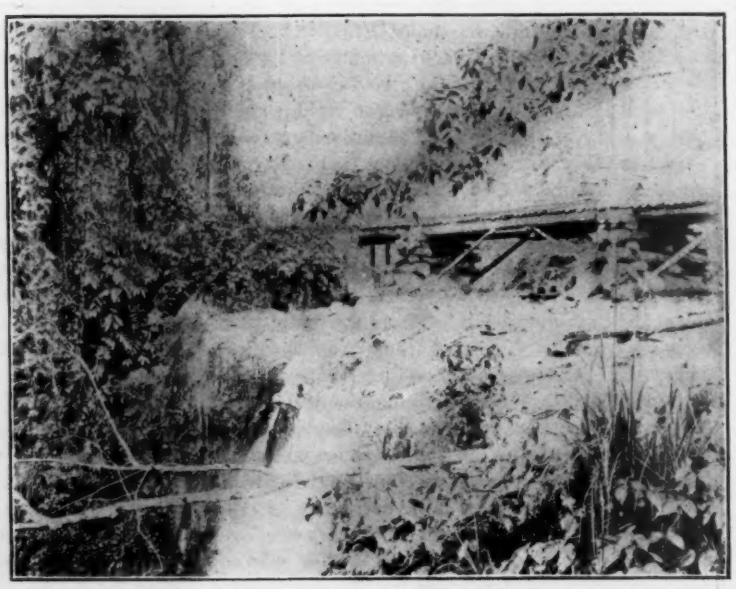


Fig. 4.

Type of Bamboo Derrick Used in Foreign Service.

is presented a model showing the design of pipe and turn employed by the natural gas workers of the Islands. The main piece may be a bam-



Fall Near Cottobatto hiver D-posits, Isle de Mindanao.

boo pole 10 to 100 feet long, with the inner thin disk partition walls punched through with a pole of smaller diameter. This hollow piece of bamboo is airtight and is capable of carrying gas or oil. The main part, *a*, is plugged at the elbow end with wood or clay and the angle effected by the joint, *b*, passing through, as shown. In this way turns are effected in the bamboo pipe lines. Leaks and crevices are plugged with clay.

Unaccounted-for Gas.

[Read by MR. JOHN PATTERSON, Tipperary, Ireland, at the last Meeting of the Irish Association of Gas Managers.]

In coming before you to-day with this paper, I think it wise, first of all, to beg your indulgence for the want of technical matter, such as is generally looked for at meetings of this nature. Having been very fortunate in my endeavors to reduce the leakage or unaccounted-for gas, at the works over the destinies of which I have the honor to preside, from a very high to a very modest figure, it was with a sense of reluctance that I acceded to the request of our worthy President to contribute a short paper on the subject under notice.

It has often struck me as somewhat surprising, and as a very regretable fact, that there are so many gas undertakings up and down the country losing from 10 to 15 per cent., and some even up to 20 per cent., of the gas they make. Yet some of those responsible appear to be quite unconcerned, and perfectly satisfied with this state of affairs, and make no effort to reduce this waste: while others will tell you that their pipes are so old that they are afraid to disturb them, lest they should go from bad to worse, and, besides, that they have plenty of other work demanding their attention. Others, again, tell you that this enormous loss is a great source of worry and anxiety to them, and that they are very anxious to reduce the leakage, if possible; but that any efforts in this direction are hampered by the road authority imposing restrictions, or wholly withholding their sanction to the opening of the roads for a systematic test, and that, consequently, they have to put up with this abnormal loss.

The last mentioned, of course, deserve our sympathy; but, at the same time, I firmly believe that the undertakings so hampered form but a very small percentage of all the undertakings laboring under a heavy leakage account; and, further, that these few could be considerably reduced by judiciously approaching the road authorities and demonstrating to them that a reduction of leakage would inevitably result in a reduction in the price of gas to the community whom they represent. For the two other classes little can be said. Those who are willing to go on in their sleepy way, losing from 15 to 20 per cent. of all their production, simply because they are able to pay a fair dividend upon their invested capital, in the case of a company, or to show a surplus on each year's working, in the case of a municipal undertaktaking, by the ready means of keeping up or raising the price of gas to the consumer, are not at all alive to their own interests, and are doing their consumers and the gas industry generally a gross injustice.

As a very able gentleman said recently, there are two ways of making profits—there is the legitimate way by practising economies and by good management, and there is the other method, which is only possible where there is a monopoly, of simply raising the price to the consumer. Of the two I think the former way is by far the more commendable. If all of us were to devote a little more of our time to our distribution plant, we would, I think, be on the right road to practical economy; and this, combined with good management in manufacture, would enable us to make our profits legitimately, and not leave ourselves open to be accused of making profits by unfair methods. Most managers with whom I have come into contact seem to spare no expense to acquire the latest novelty in retort settings, reputed to be capable of extracting an extra 100 cubic feet of gas from each ton of coal carbonized, and at the same time of saving a few pounds of fuel, yet these same gentlemen are quite satisfied to continue losing from 10 to 15 per cent. of the gas they are making, and would grudge to expend a few pounds in overhauling their distribution plant. It is an accepted fact that dividends are made in the retort house, but it is equally true that, offtimes, greater dividends are lost in the district. My personal experience at Tipperary has strengthened my conviction that a systematic test of mains and services, judiciously carried out, will repay the necessary expenditure in a very short time.

On being appointed to the management of the Tipperary gas works in April, 1898, I found that the unaccounted-for gas equalled 17 per cent. of the make; but as there were other matters in the works requiring immediate attention, it was not till the spring of 1899 that I had an opportunity of arranging for a systematic test. The method adopted was the bladder system, which consists in isolating a section of main by means of bladders, and, with a test meter having a large dial, testing the soundness of the section under observation. As I dare say you are acquainted with the system, I will not enter into further details in regard to it.

There are many who object to the bladder system, owing to the inconvenience caused to consumers through being temporarily deprived of their supply of gas, and the uncertainty of bladders, etc. The former, I must admit, is a strong objection; but as, by having everything in readiness beforehand, a section can be tested in from 15 to 20, and at the outside 30, minutes, I think few consumers would object to being deprived of their supply for so short a time at a reasonable hour. As for the latter objection, I fear the vagaries of the bladders are somewhat exaggerated; and I should never hesitate to again adopt the system on this account, as, by a simple arrangement of stop cocks and pressure gauges on the inlet and outlet of the test meter, the tightness or otherwise of the bladders can be instantly detected.

As we, in small works, have many details to attend to, I was unable to devote to the testing operations so much time as I should have liked. Having only a small staff, it was necessarily a slow process; and we only managed to get through half the district during the season. But the result, so far as we had gone, was very satisfactory, and was at once apparent; and when the accounts were closed for the year, there was an appreciable decrease in leakage.

The following season—viz., the spring and summer of 1900—was an exceptionally busy one for my outside staff (which at best is not a very large one). We were literally inundated with orders for gas cookers—a very healthy state of affairs, you will no doubt say—and we were severely taxed to fulfill all the orders we had booked in the season; so that all hopes of resuming testing operations had to be abandoned until a more opportune time. However, we recommenced operations in the spring of 1901, and continued intermittently for about 3 months, at the end of which we had got through practically the whole district, comprising, approximately, about 3½ miles of main.

We experienced considerable diffculty in locating some of the leakages, owing to the porous and gravelly nature of the soil; but in most cases, by the aid of the steel bar, little difficuliy was encountered. The net result of this systematic testing and general overhaul is shown in the following table:

Year.	Unaccounted-for Gas, Cubic Feet.	Percentage on Make.
1897-98	1,729,000	17.00
1898-99	1,485,700	16.00
1899-1900	1,151,800	9.40
1900-1	1,361,600	9.60
1901-2	683,200	5.45
1902-3	474,700	3.50

Most of the leaks were traced to bad joints on mains, consequent upon hurried and defective workmanship, and in old and corroded service pipes. During the period under notice, we renewed 46 broken and corroded service pipes, and found about the same number of leaky joints—some small, and others very heavy leaks; in certain cases up to 25 cubic feet per hour. Of fractured mains we only found three; so it is

quite apparent that, given well-laid and properly jointed mains, our greatest source of loss was through defective services.

In order to reassure any who are reluctant to undertake a systematic test, owing to their mains being very old, I may mention the fact that some of our mains in Tipperary are upwards of 50 years old, of small diameter, and laid very shallow; yet, strange to say, these were found to be practically tight, while the greatest number of leakages were found on the more recently laid pipes. In undertaking the testing of gas mains, care must be exercised not to mistake water pipes for gas mains, as did my men on one occasion; and they did not find out their mistake until they came upon a lead water service, after having stripped about 30 yards of the water main, which was of the same size as, and in very close proximity to, our main; otherwise, the results may prove very disappointing.

I now come to the subject of district pressures. Until the spring of 1899, gas cookers and gas fires were practically an unknown quantity in our district. Consequently, the day consumption was very low; and, owing to there being little demand for gas during the hours of daylight, the maximum day pressure in the district was only 7-tenths, the maximum night pressure being 18-tenths. This has all been changed now. We have upwards of 200 cookers and fires, four gas engines, and all manner of appliances wrought and manipulated by gas, in constant use during the day, which necessitates a day pressure of not less than 15-tenths to 16-tenths. Owing to the almost general adoption of incandescent burners for both public and private lighting, we have to maintain a pressure of from 25-tenths to 30-tenths, in order to insure satisfaction.

It is probably unnecessary for me to mention the fact that, luckily (or perhaps unluckily), I am not troubled with subsidences of the ground, due to coal workings, etc., injuring my mains, as are some of our more unfortunate brethren across the water; neither have I been troubled by the ravages of the steam road roller. Otherwise, matters would very likely be different, as all our mains are laid in the roadway, and some are not more than 10 to 12 inches below the surface. I may say that I am somewhat fortunate in having a very obliging and tolerant road authority to deal with, considering we are a non-statutory company. They have never objected to our opening the roads, for whatever purpose we have found it necessary to do so, but have at all times offered us every facility to put our distributing plant in order—a fact which is much appreciated by my directors and myself.

While keeping a keen eye upon, and devoting a fair portion of my time to, the distributing department, I have not done so to the neglect of the manufacturing and purifying departments. Up till 1899 the average yield of gas per ton of coal carbonized was about 9,600 cubic feet. During the past 2 years it has averaged well over 10,000 cubic feet. The coke sold per ton of coal carbonized has been constantly on the increase, and for the year ending the 1st of May last, I sold 9½ cwts. per ton. Last year we erected two new purifiers, 10 feet by 10 feet by 4 feet 6 inches; the whole of the work being done by my own staff. These are charged with oxide, and the old boxes, which are only 6 feet by 6 feet by 4 feet, are used as limers. This has enabled us to supply gas of greater purity, and, at the same time, reduce the cost of purification by one-half.

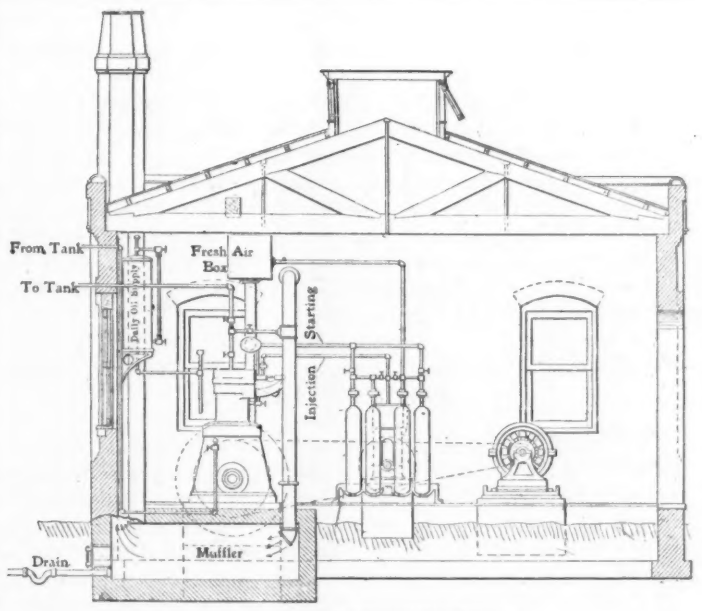
Old and defective meters are, I feel satisfied, to a great extent responsible for a fair percentage of unaccounted-for gas. Gas meters are, after all, mere mechanical appliances, and liable to go wrong at any time; yet how many gas companies or corporations make it a rule to test their meters periodically? In Tipperary we test every meter when it has attained its 10th year, and the gas saved by so doing more than warrants the expense incurred in the removal and testing.

In concluding this brief paper, I hope I may have aroused the curiosity of any who are laboring under the weight of a heavy leakage account, such as I was myself a few years ago, and I assure them they have a remedy at hand, if they will only grasp it.

The Diesel Oil Engine for Central Station Work.[1]

A departure in central station practice that is of particular interest to small stations and to municipal electricians is embodied in a municipal plant recently erected in Jewett City, a Connecticut town of about 3,000 inhabitants. A cross-section of the generating rooms is shown in the accompanying illustration. The electrical generating apparatus consists of two 60-kw., 2,200-volt, 60-cycle Westinghouse machines, and the novel feature consists of the use of oil engines for furnishing power. These engines, which were supplied by the American Diesel Engine Company, New York, are of the Diesel type, which in operation differs in several particulars radically from other types of oil and gas engines. While employing the Otto cycle, instead of an explosion at the beginning of the working stroke, there is steady combustion throughout the stroke.

1. *Electrical World and Engineer.*



Cross-section View of Generating Room.

During the compression stroke the cylinder contains air only, and the temperature due to compression ignites the combustible charge without the need of electric spark or ignition tube apparatus. The clearance is about 7 per cent. of the cylinder volume, and the combustion of the vaporized oil does not increase the pressure caused by the compression.

The valve operating cams are on the usual secondary shaft driven by the main shaft through an intermediate gear. The admission and exhaust valves are driven by two of these cams. The movement of the admission valve in particular is very slight. The oil is driven into the cylinders by compressed air through a series of perforated brass washers, and enters the cylinders in the form of a fine spray; an auxiliary air compressor, driven by belt from the engine, supplies the air for this purpose. The air which supports the combustion is drawn into the cylinder through an automatic mushroom valve, and is compressed on the up stroke to between 450 and 525 pounds pressure per square inch, corresponding to a temperature of about 1,000° F. The fuel valve is open for about one-tenth of the working stroke, and the fuel is let in and consumed during the whole or a part of this period as determined by the action of the governor. At the termination of the fuel supply, the resulting gases of combustion work expansively during the remainder of the stroke. The combustion is very complete on account of the large quantity of oxygen in the cylinder at the beginning of the working stroke. Any grade of crude or fuel oil may be employed in the engine. The fuel oil is delivered to the fuel admission valve by a pump driven from the cam shaft. One pump cylinder is provided for each of the main cylinders, and back of each is a by-pass valve, which, when open, allows the oil to flow again to the suction side of the pump instead of to the fuel valves. The length of time that these by-pass valves are open is controlled by the governor, which is of the centrifugal type. The by-pass valves are opened by 3 arms that are pivoted at one end on a shaft that the governor raises or lowers. These arms are operated by connecting rods driven by eccentrics on the pump driving shaft. By a link connection, the governor collar thus increases or lessens the distance between the top of the by-pass valve rods and the arms which open them. Upon the relative distance between the top of each valve rod and its corresponding arm depends the length of time the valves are open, and the consequent duration of oil supply for combustion purposes.

After the fuel valve closes, the gases work expansively, and the atmospheric and terminal pressures differ but little. The effect of the compressed air used to inject the fuel is inappreciable. The admission valve is open a constant length of time, but the fuel supply is controlled by the governor as just described, so that only at full loads is it injected into the cylinder during the entire period that the valve is open. It has been stated that the thermal efficiency of the Diesel engine runs as high as 38 per cent.

In general outward appearance the engine resembles the ordinary marine type of steam engine. The connecting rod is carried directly to a pin inside the piston, as usual in single acting engines. The reciprocating parts are all inclosed within the engine housing, which is fitted with detachable plates for easy access. Lubrication is automatic, a large oil well in the lower part of the housing serving as a bath into

which the connecting rod crank end plunges at every revolution. Double flywheels are provided for each engine in addition to the driving wheel.

The manufacturers claim an extremely high economy for this type of engine. It is stated that while the best oil engines of the explosive type have an efficiency of 16 per cent. and the best gas engines an efficiency of 19 per cent., the Diesel oil engine works at an efficiency of 28 per cent., with the cheapest grades of fuel oil. Moreover, at partial loads the efficiency is much less reduced, the consumption at half load being, for example, only 60 per cent. of that at full load. It is further claimed that a brake horse power hour can be produced on .58 pint of kerosene or .61 pint of Texas crude oil.

Proposed Municipal Ownership of Electric Lighting Plant, Cleveland, O.

Municipal Engineering notes that the city of Cleveland, O., has been considering the construction of an electric lighting and power plant, not only to provide for supplying light to the streets and public buildings of the city but also to enter into competition with other light and power companies. Mr. E. W. Bemis, superintendent of the water works, and Mr. C. E. Phelps have made reports upon the cost of the plant and of its operation and maintenance, which were used as the basis for an ordinance providing for the issue of bonds to raise money for an electric light and power works. No competent bids for the bonds having been received, a new ordinance was introduced omitting the word power.

A special committee of the Cleveland Chamber of Commerce has been considering the subject and has presented a report opposing the project. The grounds for the opposition may be summarized with some comments by the way, as follows:

1. The only reason for the plant given is the statement that the city and the citizens can get light cheaper than from private companies. The committee denies this on the ground that experience demonstrates the opposite. So far as municipal light is concerned the Detroit and especially the Chicago plants (see *Municipal Engineering*, Vol. xxii, p. 376) are evidence of its truth. The reports of the Massachusetts Board of Gas and Electric Light Commission are also in its favor. In *Municipal Engineering*, Vol. xxiii, p. 160, the figures for 1900 are given showing that the towns buying light from private plants paid 26 per cent. more than it cost the towns furnishing their own light, interest on total cost of system and 5 per cent. depreciation being included. Some individual instances can be cited which will favor the committee's statement, but the total of available information supports that of Mr. Bemis.

2. The Company's rates are not unreasonable, but if they were they could be regulated by the city and fixed at a reasonable figure. If this is true, the necessity for a municipal plant is not great, but an attempt to reduce the rates 26 per cent., which seems to be possible in Massachusetts towns for public lighting, would bring out many arguments to support the necessity of retaining the present rates. However, this point does not seem to apply to Cleveland.

3. The Company has reduced the price for street lamps per year from $94.80 in 1896 to $75 in 1903. The candle power and hours per lamp in the 2 years are not stated, but if they are the same the reduction has been nearly 26 per cent. and the price is now near the average for cities, and less than the average for cities of Cleveland's approximate size. Judging from experience, the cost of light in a large municipal plant may easily run over $75. Cleveland may therefore at present prices be an exception to the general statement made in the first paragraph.

4. The committee's report states that errors have been found in the engineer's estimates which in their opinion would increase the cost of the plant 25 per cent., to $500,000 for the plant to serve the West Side and the public buildings on the East Side, leaving the vastly larger East Side territory unprovided for.

5. It is considered unjust to force taxpayers to go into a business venture supplying a small portion of the population and possibly running at a loss. The committee therefore recommends that the bonds be made a lien on the electric plant only. From one point of view this seems to be eminently proper, since each business venture should stand on its own feet. But the gentlemen composing the committee are doubtless familiar with the successful business ventures which were started upon the credit of existing establishments or of individuals who were fully supported in their ventures by such establishments, and were only set to run alone when they reached a self-supporting stage. One of the prominent reasons given for the greater economy of municipal ownership is the possibility of raising funds at much less expense, the interest on bonds usually being materially less and the lack of cost of promotion and of other water in the stock reducing the capital on which interest must be paid from 50 to 90 per cent. This advantage is lost, at least in part, if the credit of the city is not given to the enterprise. With very few exceptions, due to bad business methods, municipal lighting plants have not run their private business at a loss, and with very few exceptions the cost of public light has been equal to or less than that purchased from private companies. Failures from bad business methods have not been more numerous in municipal than in private plants. The taxpayer therefore pays nothing towards toward the construction or operation of the municipal plant if the interest on bonds and sinking fund are made charges upon the plant, as they should be, and his only share in the expense is his payment for public light. This he pays if the city purchases its light from a private company and this he should pay if the city owns the plant. As stated above, he is likely to pay less in the case of a municipal plant, Cleveland being a possible exception to this statement. The present laws would not permit this limitation of the liability for the bonds to the electric light plant and it is not likely that the people will agree that it is advisable to change them so as to make it possible.

6. The city needs other public improvements more than it needs a municipal electric light plant.

7. It is doubtful whether the municipal departments are now operated so satisfactorily as to warrant an extension of municipal ownership in the city. There is room for difference of opinion upon this point and changes can be made when the voters (the stockholders in the municipal corporation) choose to elect officials who will represent them and will keep them in office as long as they perform their duties honestly and efficiently.

8. The levy of a tax for the construction of the municipal plant is deemed an improper use of the taxing power. If the levy is for the purpose of paying any more than the actual cost of the public light, this is eminently true. It is never right to levy a tax solely for the benefit of a single individual or interest. It is not probable that the promoters of the municipal plant expect anything of this sort to be done. The committee undoubtedly misunderstands the situation if it believes that this is the case.

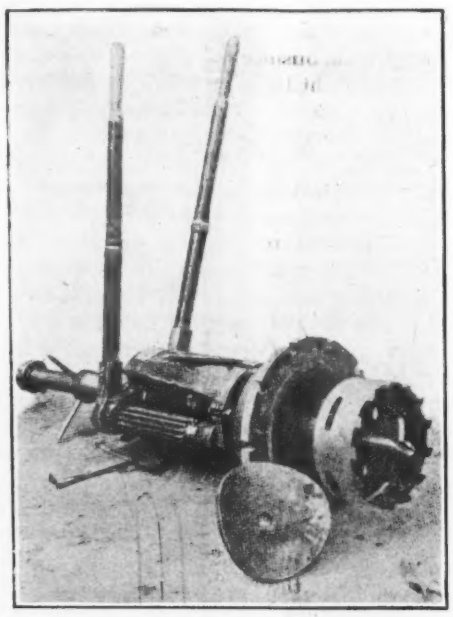
9-10. The committee sees no reason for the presentation of the proposition at this time and recommends that the ordinance be not passed. Although some of the arguments and statements are not supported by the sum of our knowledge the final conclusion seems to be correct, under present circumstances.

The Smith Tapping Machine.

We are indebted to a correspondent in Liverpool, England, for calling our attention to the merits of the Smith tapping machine, a description of which recently appeared in *Engineering*, London. In that description our contemporary says: The problem of joining a pipe of considerable size to another pipe which has the pressure within it is one that has always had an attraction for engineers, on account of the trouble and difficulty which attend turning the pressure off from a long line of mains and emptying the pipe. It may happen that a main supplies a portion of a town in which works are situated which are dependent upon a constant supply of water; and in any case it is a serious matter, from the point of view of the fire brigade, to cut off the water from a large section of a town. The Smith tapping machine has been devised for the purpose of enabling one main to be connected to another without any reduction of pressure. It was originally brought out in the United States, and has been used there for some years; but it is now being introduced into England by Messrs. Clark W. Harrison & Co., 72 Fenchurch street, London, E. C., who have recently carried out the connection of a 12 inch branch to a 14-inch main under pressure at Cardiff, to the complete satisfaction of Mr. Priestley, engineer of the Cardiff Water Committee.

Part of the apparatus is shown in the illustration annexed. In addition to the part shown, there is a specially designed sleeve, which is first clamped on to the main, with sufficient room between the exterior of the pipe and the interior of the sleeve for lead to be run in between the two and caulked in the ordinary way. When this sleeve is applied, it constitutes a jacket which is fixed water tight all round the pipe. On one side of this sleeve there is a socket pointing in the direction of the new main, and on to this socket there is fixed a patent valve made with a special spigot to fix into the socket. The valve is fixed in position, and a joint made with lead and caulked in the usual way. The sleeve and the valve are thus attached firmly to the main. This valve has a

clear way through it, somewhat larger than the hole which is to be cut in the main, and ends with a flange designed to receive the flange shown in the illustration. The two are bolted together, and then all is ready for cutting a disk out of the main.



It will be seen that the tapping machine carries a drill, and also a hollow cutter, which, in the case at Cardiff, was 12 inches in diameter. The spindle of the drill passes through a stuffing box, because when it has bored a hole through the pipe, the water pressure obtains access to it. The spindle is pushed forward until the central drill touches the pipe. The spindle is then locked, owing to the feed gear, and the cut is ready to be made by means of the ratchet levers seen in the illustration. The drill first passes through the pipe and thus forms a bearing to steady the cutter; this cutter is rotated and fed forward until it cuts a disk out of the main. In the engraving the disk itself is shown lying beside the tool. As soon as the cut is completed, the cutter, together with the disk, are withdrawn to the back of the valve door; the valve is then closed, and the machine unbolted and removed, leaving the end of the valve ready to receive the end of the branch main.

The connection at Cardiff is the largest that has ever been carried out in this country, but in America a 36-inch branch has been connected by means of this machine to a 48-inch main. It will be recognized that there are many cases in which such a main will be of very great advantage, and will enable water works engineers to make connections with far less trouble and thought than they have hitherto been obliged to spend on such matters. The Smith tapping machine takes up little room, requires only a moderate amount of excavation and pulling up of roads and thoroughfares, and any ordinary mechanic is capable of managing it.

Petroleum in California.[1]

By Mr. Edmond O'Neill, Berkley, Cal.

Within the last few years California has developed a new industry, that of petroleum. The knowledge that it existed is not new. Seepages occur in various parts of the State, and natural gas is found over a very large area. Immense deposits of asphaltum occur in the southern counties and were used by the early Mission Fathers. Attempts were made to distill the crude oil, and in 1855 Pico erected a small refinery.

The discovery of oil in Pennsylvania produced great excitement, not only in the east but in California. Claims were located in all parts of the State and companies formed to work them. In 1865 there were 65 companies in existence with a nominal capital of $45,000,000. Oil properties were exploited in every county from Humboldt to San Diego, but there was no apparent success, owing to lack of prospecting, insufficient depth of wells, and to the opinion of eminent chemists and geologists that the oil would not be found in large quantities, and could not be refined.

Petroleum occurs in every part of the State, but as yet only the southern part yields any large quantity. Ventura, Los Angeles, Orange, Santa Barbara, Kern and Fresno counties furnish practically all the oil that is produced, although in many other counties small yields have been obtained.

Los Angeles, in common with other districts, was exploited nearly 40 years ago, but no oil was obtained. The wells were not bored deep enough. Nothing further was done for 30 years, until in 1892 a well 365 feet deep was sunk and yielded oil. In 3 years, more than 300 wells were drilled and most of them yielded oil. Other districts in the neighborhood were exploited, and hundreds of new wells located. The production of oil rapidly increased until in 1897 it had reached 1,400,000 barrels. The total amount of oil obtained from the Los Angeles district amounts to more than 9,000,000 barrels. About 1,400 wells have been dug, none of them very deep. The oil sand averages about 60 feet in thickness. A second sand has been worked with profit, and it is believed that a third sand exists.

Other districts in Los Angeles county have been worked for oil, the the principal ones being Whittier, Fullerton and Puento. This oil is usually light in gravity, so much so that the most of it is distilled and only the residuum used for fuel. In Ventura county there are more than 500 wells, over 300 of them being worked now; they are from 500 to 2,000 feet deep. Practically all are owned by the Union Oil Company. In Santa Barbara county, oil seepages have long been known. In 1895 some wells were dug on the beach at Summerland, and oil was struck at the depth of only 125 feet. The deepest are only about 400 feet. Since then more than 300 wells have been bored, some on the beach and some on the ocean, 400 to 1,200 feet from the shore. Some of the wells in other districts are 1,000 or more feet deep. The oil is heavy, averaging about 14° B. The yield is between 8,000 and 10,000 barrels a month but has been much more. The Fullerton and Brea districts in Orange county produced last year over 1,000,000 barrels.

The oil varies greatly in gravity, from heavy, 14° B., to as light as 35° B.

North of the Tehachapi, the whole valley of the San Joaquin seems to be underlaid with oil, although as yet only a small area is worked. The principal fields are in Fresno and Kern counties. In Fresno county is the well-known Coalinga district. This field is limited in extent, extending over but a few sections, but in this area there are very many wells. Some are very deep, one being 2,300 feet. The oil is of different qualities, some very heavy and black in color, others very much lighter, about 35° B. There are two pipe lines to transport the oil to the railroad, and a pipe line to the ocean is about to be commenced.

Another district in Fresno that has produced some oil is Kreyenhagen, 22 miles southeast of Coalinga. Like Coalinga, it produces two qualities; one green and light, 35° B., and one black and heavy, 14° B. Other districts have been prospected but they yield little or nothing.

In Kern county we come to the largest field that has yet been discovered. It has developed marvelously, over 600 wells have been dug and nearly all are producers. Some of them yield only a few barrels a day, but most of them are about 50-barrel wells. Some have produced much more, 200, 400 or even 600 barrels a day. None of them are flowing. The average depth of the wells is about 800 feet; some are less than 500 feet, and the deepest are less than 1,100 feet. The oil is thick, black and heavy, ranging in gravity from 9° B. to 22° B., usually being from 14° to 17° B. It usually carries much fine sand, from which it is freed by settling. The oil is sometimes previously thinned by heating with steam. The oil carries large amounts of asphaltum, from 10 to 40 per cent.

The present well defined producing area of the Kern river district measures about 5 miles long and 3 miles wide, the longer axis extending in a northwesterly direction, and the thickness of the oil sand varies from 50 to 400 feet, a large proportion being of the latter depth. The limits of the field have probably not been reached, and in time the producing area will probably be enlarged. 20,000 to 25,000 barrels a day are shipped from this district, and this yield could be increased many fold, if there was a sufficient demand. Owing to the lack of demand and consequent low price of oil, many of the wells are not pumped, the owners waiting for better prices. A pipe line is being constructed by the Standard Oil Company from Bakersfield to their refineries at Port Richmond on San Francisco Bay, a distance of 280 miles. The pipe is 8 inches in diameter, covered with asbestos and buried. The reason for this is that the oil is so viscous at ordinary temperatures that it cannot be pumped. It must be heated, and at every pumping station, which are 27 miles apart, a heating plant is installed. The company has also built 100 37,500-barrel storage tanks at Bakersfield and two 75,000-barrel cement reservoirs. The large area of the field and the

1. *Jour. Am Chem. Soc.*

great thickness of the oil sand indicate that the life of the wells will be very long. The Kern river field is the most important in California and produces more than half the entire yield of the State.

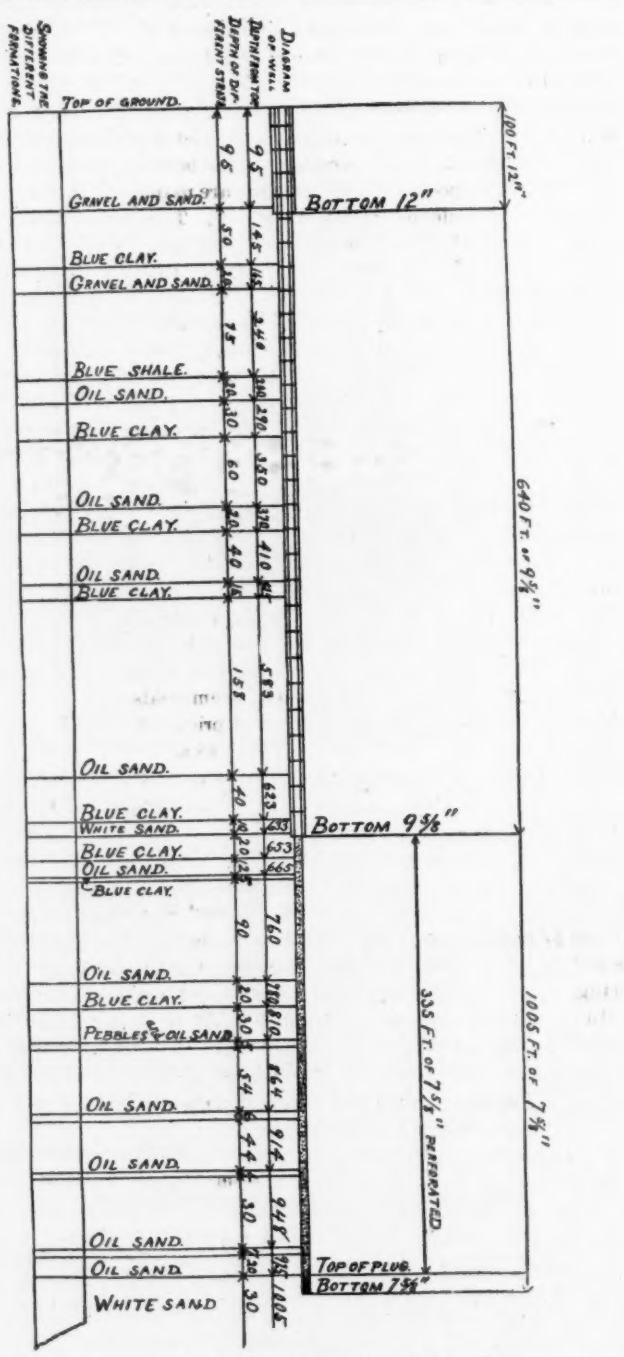
Another part of Kern county where petroleum is found is the McKittrick district. Here are large deposits of asphaltum that are worked by the Southern Pacific Railroad. They have built a branch 65 miles long, terminating at Asphalto. This district contains a few good wells, but many are useless. Some give very large amounts of water. The oil is light, about 33°, and the yield is about 50,000 barrels a month. A third district in Kern county is the Sunset. This has also been worked for asphaltum for nearly 10 years. It has lately been developed for oil. Over 50 companies are operating; some have good wells, as much as 100 barrels a day, but most of them are barren. Nearly all are troubled with fine sand that caves in and chokes the wells and also remains in the oil. There is a great lack of water. What there is is usually salt or alkaline. Most of the oil is heavy, containing about 30 per cent. to 40 per cent. asphaltum of good quality. The asphaltum for a time was more valuable than the oil, owing to the lack of transportation. This has been remedied by the railroad building a branch line connecting at Bakersfield. The adjoining Midway district appears promising but as yet has not produced much.

The foregoing are the districts that produce practically all the oil in California. But it has been found in greater or less quantity in almost every county, and also in parts of Oregon, Washington, British Columbia and as far north as Alaska. Some of the counties in which prospecting has been carried on extensively are, all the southern counties and in San Benito, Monterey, Santa Clara, San Joaquin, San Mateo, San Francisco, Alameda, Contra Costa, Napa, Sonoma, Colusa, Tehama, Mendocino, Humboldt and Shasta counties. Occasionally the wells have been bored very deep. Some in Contra Costa and San Mateo are 1,200 feet deep. There is a well in Humboldt in the Mattole district over 2,000 feet deep. They have all yielded a small amount of oil, but there are no wells that give more than a few barrels a day. The oils along the coast from Santa Clara northwards in San Mateo, Mendocino and Humboldt counties, and eastward to Colusa county, are very different in quality from the southern oils. They are lighter in color—usually yellow—lighter in gravity, varying between 19° B. and 40° B., and contain a paraffine residue, with little or no asphaltum.

To recapitulate, we find that oil is distributed over this entire western coast, but as yet practically the whole amount produced comes from a few districts in the southern part of California. The following table compiled by Mr. C. L. Yates for the State Mining Bureau, will illustrate this.

The statistics for last year have not been accurately compiled, but the total amount produced will be 13,000,000 barrels. In spite of this greatly increased supply, the price is gradually rising, and when the present long term contracts have expired, the price will probably go still higher.

The method of boring wells is practically the same as used in the East. The character of the formations passed through varies greatly according to the district. As the Kern river district is the largest, the following diagram showing a typical well is given:



Typical Well of the Kern River District, Bakersville.

Petroleum Production of California from 1897 *to* 1901.

County.	1897. Product, Bbls.	Value.	1898. Product, Bbls.	Value.	1899. Product, Bbls.	Value.	1900. Product, Bbls.	Value.	1901. Product, Bbls.	Value.
Fresno	70,140	$70,840	154,000	$154,000	439,372	$439,372	547,960	$547,960	525,433	$236,444
Kern	....	....	10,000	10,000	15,000	13,500	919,275	827,348	3,902,125	1,131,616
Los Angeles	1,327,011	1,327,011	1,462,871	1,462,871	1,409,356	1,409,356	1,722,887	1,722,887	2,304,432	1,062,038
Orange	12,000	12,000	60,000	60,000	108,077	108,077	254,397	254,397	302,652	181,591
Santa Barbara	130,136	130,136	132,217	112,549	208,370	191,288	183,486	165,138	203,616	113,385
Ventura	368,282	368,282	427,000	571,000	496,200	496,200	443,000	398,700	472,057	236,028
Miscellaneous	4,000	10,000	3,000	6,000	1,500	3,000	248,945	236,498	....	....
	1,911,569	$1,918,269	2,249,088	$2,366,420	2,677,875	$2,660,793	4,329,950	$4,152,928	7,710,315	$2,961,101

There is apparently much difference in the quality of California petroleums obtained from different localities, but actually they are very much the same. The differences probably result from natural distillations or filtrations, a lighter oil being obtained, leaving a heavy residue containing asphaltum. Extreme variation is from 10° B. for oils of the McKittrick and Sunset district, to 35° B. for Coalinga and Puento. A water-white oil is found in the Newhall district that has a gravity of only 50° B. and leaves scarcely any residuum. It is evidently a natural filtrate or distillate. San Mateo, Colusa and Humboldt oils are apparently very different from most of the others, as they apparently contain little or no asphaltum. They have a gravity of from 17° to 50° B.

Chemically considered, California petroleums seem to be intermediate between Eastern and Russian oils. They contain paraffines, benzenes and naphthenes. Most of them contain nitrogen and sulphur. The sulphur seems to be contained in a volatile body, and is frequently almost entirely removed in a fraction boiling between comparatively narrow limits.

The chief use of California crude petroleum is for fuel. Many of the large steam plants have discarded coal and now burn oil. The annual consumption of coal in California has been nearly 2,000,000 tons, and nearly half of this has been displaced by oil. Crude oil in bulk does not burn readily, especially if it is heavy. A special form of burner

must be used. The usual method is to inject the oil in a very fine spray, by means of steam, and the heated, finely divided particles will burn easily and completely.

As the flame is exceedingly hot, it is directed on to brickwork on the bottom of the firebox, and the boiler heated to a large extent by radiation. The intense heat is wearing on the boilers, but the advantages of oil over coal, especially on this Coast, are many. It is more convenient to handle—it is cleaner and it is cheaper. The liquid oil is transported much more easily than the solid coal. When properly burned, there is no smoke or soot or cinders. There are no ashes, so the boiler tubes do not get stopped up.

Oil heating is particularly desirable for locomotive engines. Ease of loading and firing and absence of cinders, with consequent comfort to passengers, and no danger of setting fire to grain fields or fences, are self-evident advantages. In Russia, nearly all the locomotives are thus run. Many of the engines in this State are oil burners, and it is only a question of time when practically all will be altered. The cheapness depends partly on the relatively greater economy in handling and partly on the greater heating value as compared with coal. Seven barrels of oil will weigh about a ton; at a cost of $1.25 per barrel, this would be equivalent to $8.90 per ton; at $1.50 per barrel, $10.50 a ton. But the heating value of oil, weight for weight, is greater than that of coal. From a number of experiments we have made in our laboratory, we find that the heating value of California oil is between 10,000 and 11,000 calories, averaging about 10,500. The best coals of this Coast average 7,000 to 8,000 calories, and the usual steam coals much less. Comparing the cost of coal and oil at the above prices as to the theoretical heat value, a ton of oil would be worth $6 to $8 and the coal $8 to $9. The actual difference is very much greater than this, as there is much less waste in oil heating. From many actual experiments made under boilers, it has been found that from 4 to 4½ barrels of oil are equivalent to 1 long ton of good coal, a saving of from 25 per cent. to 40 per cent., so that coal cannot compete with petroleum at the present prices, nor can it until its cost is reduced to between $4 and $5 a ton, whereas it is between $7 and $8 a ton, and the best qualities bring from $10 to $14. Oil is selling in San Francisco now at less than 70 cents a barrel. This brings the cost of fuel on this Coast to a par with the cost in the East, with its consequent great advantages. The smelters around the bay are using oil with a saving of over 50 per cent. in the cost of fuel.

Physical Characteristics of California Petroleums.

Serial No.	Lis'rict.	Color.	Gravities Temperature. Degrees C.	Corresponding. Degrees B.	Flashing Point. Degrees C.	Burning Point. Degrees C.
54	Los Angeles.	Black.	0.9589 at 15.0	16.1	115.5	134.0
116	Whittier.	"	0.9397	19.3	....	....
87	Ventura.	"	0.9460 " 22.0	18.3	73.0	80.2
155	"	"	0.9830 " 11.0	11.6	....	...
50	"	Brown.	0.9143 " 18.0	23.6	....	....
186	"	.....	0.9159 " 15.0	22.8	29.0	35.0
93	Newhall.	Water-white.	0.8059 " 19.0	45.0	....	....
156	Kern.	Black.	0.9572 " 18.5	15.7	....	....
157	"	"	0.9533 " 20.3	15.9	....	....
111	"	"	0.9760 " 18.0	13.5	....	....
112	"	"	0.9651 " 18.1	15.1	....	....
134	McKittrick.	"	0.9458 " 18.0	18.5	....	....
135	"	"	0.9628 " 18.0	15.4	...	....
103	Sunset.	"	0.9589 " 17.0	16.2	...	....
85	"	"	0.9245 " 18.0	22.0	....	...
149	Summerland.	"	0.9815 " 21.0	12.7	....	....
147	"	"	0.9792 " 21.0	13.0	...	....
160	Coalinga.	Brown.	0.9276 " 21.1	21.4	70.0	94 0
52	"	"	0.8962 " 26.2	27.0	....	....
51	"	"	0.9493 " 17.4	17.9	....	...
159	Santa Clara.	Light brown.	0.8515 " 18.0	34.4	89.5	104.0
184	San Mateo.	Brown.	0.9206 " 15.0	22.6	90.0	102.0
127	Santa Cruz.	Black.	0.9565 " 18.0	16.8	...	....
100	Napa.	Brown.	0.9603 " 18.0	16.0	131.0	138.0
98	"	Dark brown.	0.9655 " 18.0	15.1	135.0	140.0
154	Colusa.	Yellow.	0.8229 " 19.0	40.0	...	....
142	Contra Costa.	Black.	0.9653 " 17.0	15.1	...	....
161	Humboldt.	Red-brown.	0.8810 " 15.5	28.9	....	....
94	"	Yellow.	0.8992 " 18.0	26.3	41.0	44.0
95	"	"	0.8951 " 18.0	27.0	109.0	114.0
96	"	"	0.9489 " 19.0	17.9	101.0	117.0
99	"	"	0.7825 " 19.0	50.5	17.0	18.0
101	"	"	0.8263 " 15.0	40.6	less than 10.0	less than 10.0
187	....	.....	0.9670 " 15.5	15.0	91.0	105.0

Outside of fuel, crude petroleum is used to a slight extent on this Coast in gas making, as a coarse lubricant and as an insecticide in the orchards. A comparatively small amount is thus consumed. The Elmore process for concentrating ores, which employs petroleum, may consume a quantity.

The refining of oil is conducted on an increasing scale; 33 refineries are now in operation. The capacity varies from 50 to 2,000 barrels a day, the aggregate amounting to from 8,000 to 10,000 barrels daily. The usual distillates are made—benzenes, illuminating and lubricating oils. None of these except the benzenes are of very good quality. They are used chiefly to mix with Eastern oils.

The asphalt residue is of excellent quality and finds a ready sale. In fact, in some cases, the oil was used for the asphaltum only, the distillates being rejected.

The future of the oil industry appears to be bright. The southern part of the State appears to contain a large supply of petroleum, particularly in the upper part of the San Joaquin valley. There is a large demand for fuel purposes alone, and there is little doubt but that uses for the distillates will be found. Benzene derivatives appear to be present in considerable quantities and it will pay to separate them. The greatest significance, however, will be the solution of the fuel problem.

As very little has been published in regard to the character of California oils, the foregoing results may be of value. They have been compiled from analyses made in this laboratory during the past 2 years. They cover oils from the various districts, and serve to show the great variance in physical characteristics.

Specific Viscosities of Crude Oils at 60° F. and 185° F. = 15½° C. and 85° C.

Sample Number.	15.5° C. 60° F.	85° C. 185° F.	Sample Number.	60° F.	185° F.
145	4.88	1.28	135	282.03	3.57
134	63.15	2.12	149	1,462.83	8.35
157	299.59	4.70	160	11.19	1.54
161	1.57	1.05	95	3.00	1.15
101	1,759.13	7.51	99	1.17	0.96
156	373.11	3.67	100	10.35	1.34
184	10.96	1.50	186	34 28	1.84
101	1.10	0.95	192	3,259.27	9.00
112	274.35	3.35	187	347.77	3.37
2	19.40	1.60	4	16.96	1.53
138	396.72	4.28	113	142.66	2.85
189	310.56	3.38			

It will be noticed that the viscosity diminishes very rapidly as the temperature increases. At a temperature of 100° the viscosity approaches that of water or may even be less.

The following table shows the percentage of volatile matter at

Fractional Distillation of California Petroleum.

Serial Number.[1]	District.	Water.	Below 100° C. " 212° F.	100° C. to 150° C. 212° F. to 302° F.	150° C. to 250° C. 302° F. to 482° F.	250° C. to 350° C. 482° F. to 662° F.	350° C. to Asphalt 662° F. to Asphalt.	Asphalt.	Loss.
111	Kern.	1.4	0.00	0.00	3.9	34.0	27.2	31.6	1.9
112	"	0.5	0.00	1.00	9.25	19.74	48.13	21.25	..
160	Coalinga.	0.00	0.00	1.10	21.70	40.70	21.50	14.60	0.4
99	"	0.00	0.00	32.60	28.20	17.20	16.00	5.00	1.0
51	"	1.00	0.00	0.80	15.00	42.50	14.50	25.40	0.8
52	"	0.20	7.70	10.30	18.70	30 00	18.00	16.20	0.9
134	McKittrick.	0.00	0.00	0.00	19.10	20.80	45.82	14.25	..
135	"	0.00	0.00	trace	8.50	23.50	53.25	15.00	..
85	Sunset.	0.00	0.00	6.50	17.26	17.25	47.98	11.00	.
103	"	0.00	0.00	0.00	11.90	26.40	37.80	23.90	..
87	Ventura.	2.74	....	....	....	....	....	....	..
155	"	9.50	0.00	0.00	11.20	34.05	8.75	36.50	..
50	"	0.00	0.00	17.00	11.50	9.00	21.50	41.00	..
186	"	0.00	2.50	9.50	16.00	54.50	2.20	13.80	1.5
101	Humboldt.	0.00	0.00	39.50	29.80	24.00	1.50	4.70	0.5
161	"	0.00	0.00	0.00	47.50	35.20	9.60	7.50	0.2
94	"	0.00	0.00	13.70	33.40	22.20	10.80	19.40	0.5
95	"	0.00	0.00	0.00	15.70	35.10	44.30	4.90	..
96	"	0.00	0.00	0.00	16.10	53.60	3.20	26.50	0.5
99	"	0.00	5.20	27.40	28.20	17.20	16.00	5.00	1.0
100	Napa.	0.00	0.00	0.00	0.00	87.00	4.20	9.00	..
98	"	0.00	0.00	0.00	0.00	15.70	72.60	11.40	0.3
154	Colusa.	0.00	0.00	0.00	8.80	96.00	21.60	0.50	0.1
93	Newhall.	0.00	12.50	46.20	32.27	....	3.23	5.30	0.5
159	Santa Clara.	0.00	....	15.00	35.80	31.20	14.40	3.60	..
142	Contra Costa.	5.70	0.00	3.70	17.50	37.00	15.20	21.00	0.1
127	Santa Cruz.	21.50	0.00	0.00	6.20	34.00	14.40	22.80	1.1
149	Summerland.	25.00	0.00	0.00	6.50	17.10	27.50	22.50	1.4
184	San Mateo.	14.90	0.00	0.00	0.00	0.00	58.90	26.00	0.2

1. Numbers are volume per cent.

various temperatures. It is of value chiefly as showing the variant character of the oils from diffe rent districts. The analyses were carried out under practically the same conditions, and the results are comparative.

The percentage of carbon and hydrogen is shown in the following table: The difference is not put down as oxygen for the reason that most of the oils contain at times considerable quantities of nitrogen and sulphur.

Oil. Serial No.	Hydrogen Per Cent.	Carbon. Per Cent.	Specific Gravity.	District.
145	10.84	88.26	0.9700	Colusa.
114	11.30	85.80	.....	Bakersfield.
115	11.50	86.09	0.9397	Whittier.
155	10.81	80.42	0.9830	Ojai Valley.
170	12.16	84.86	0.9572	Kern.
156	10.72	86.32	0.9572	Bakersfield.
110	11.18	82.45	0.9760	Kern.
134	11.45	86.06	0.9458	McKittrick.
157	11.30	85 75	0.9533	Kern.
103	11.30	85.83	0.9589	Sunset.
142	10.83	84.66	0.9653	Contra Costa.
177	10.70	84.74	.....	.....
169	11.80	87.62	0.8620	Coalinga.
162	12.10	87.41	.....	.....
...	12.74	86.99	0.8059	.....
...	11.82	86.61	.....	.....
100	11.13	88.08	0.9603	Napa County.
161	12.03	86.69	0.8810	Humboldt.
159	12.88	86.08	0.8515	Santa Clara.

The percentage of sulphur and nitrogen is shown in the following table: Various methods were tried for the determination of the sulphur, but the most accurate and convenient was to effect the combustion of the oil in oxygen at 25 atmospheres pressure in a Mahler bomb, and determine the sulphuric acid produced. Apparently none of the sulphur escaped oxidization. On allowing the gases to pass through bromine water, the solution gave no trace of sulphuric aid.

The Kjeldahl method was used for determining the nitrogen. Oxidation was slow but complete.

Sulphur and Nitrogen in California Petroleums.

Number.	Specific Gravity.	Nitrogen. Per Cent.
1	0.8254	0.001
103	0.9589	0.047
115	0.9306	0.669
169	0.8679	0 100
171	0.9774	0.0278
172	0.9629	0 185
174	0.8749	0.243
175	0.8801	0.204
150	0.9720	0.155
		Sulphur, Per Cent.
154	0.8229	0.50
156	0.9572	0.80
157	0.9533	0.668
159	0.9515	0.920
169	0.8679	0.062
135	0.9628	0.880
134	0.9458	0.870
115	0.9397	0.700
112	0.9651	0.950
103	0.9589	0.86

The following table shows the calorific value of various California oils. The determinations were made in a Mahler bomb, with oxygen at 25 atmospheres pressure, in the usual manner.

Calorific Value of California Petroleums.

Number.	Specific Gravity.	Deg. B.	Calorific Value— T.U. (Calories.)	B.T.U.
103	0.9589	16.3	10,380	18,684
111	0.9760	13.5	10,190	18,642
112	0.9651	15.2	10,471	18,847.8
113	0.9518	17.5	10,350	18,830
115	0.9397	19.5	10,827	19,488.6
129	0.8861	28.6	10,800	19,440
134	0.9458	18.5	10,375	18,675
135	0.9628	15.6	10,317	18,570.6
...	0.9276	21.1	10,531	18,956
159	0.8515	34.4	10,192	20,145.6
145	0.9700	14.5	10,360	18,648
115	0.9397	19.3	10,725	19,305
156	0.9572	16.5	10,359	18,646.2
110	0.9760	13.5	10,263	18,473.4
157	0.9533	17.2	10,443	18,797.4
103	0.9589	18.0	10,380	18,684

Many more results of determinations might be given, but the foregoing serve to give an idea of some of the characteristics of California crude petroleum, and indicate the great diversity in physical properties. Chemically, they resemble each other much more closely, as will be shown in a subsequent paper.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. Paul Doty has resigned the position of General Manager to the Detroit (Mich.) Gas Company to accept the dual place of President and General Manager of the Denver (Col.) Gas and Electric Company, succeeding Mr. Irvin Butterworth. Mr. Butterworth goes to Detroit to take up the duties relinquished by Mr. Doty.

Mr. George H. Harper, Manager of the Altoona (Pa.) Gas Company, writing to the Journal under date of the 31st ult., says: "I was very much surprised to find a paragraph, copy of which is inclosed, in your issue of to-day, and am at a loss to know where you got such information. The statement has absolutely no foundation in fact. No special election will be held to-morrow for the purpose specified, nor is there the slightest hint of any such in contemplation. I would respectfully ask that you make correction in your next issue, as the statement published if uncontradicted might be prejudicial to this Company's interests."

The statement referred to by Mr. Harper was the following: "Tomorrow the citizens of Altoona, Pa., will vote in special election as to whether or not the city shall engage in the operation of a gas plant on municipal account." The explanation is simple, although the error might have been serious. The place really concerned in the election was Altona, Ia., instead of Altoona, Pa.

The following is from the Baltimore (Md.) *Herald*, dated August 28: "The last of the big coke ovens at Sparrows Point, designed to supply a large quantity of illuminating gas to Baltimore, was placed in operation yesterday afternoon. In the entire plant there are now 4 batteries of ovens, and in each battery there are 50 ovens, making 200 in all. The plant has a capacity of 1,200 tons of coke per day of 24 hours and of 10,000,000 cubic feet of gas. The ovens are of the United Coke and Gas Company's by-product type, and each of the 4 batteries is independent. The ovens are 30 feet in length, 8 feet in height and 2 feet in width, and the coal is chuted into the top. It is baked for 24 hours, at the end of which time a ram forces the resultant coke out. Each oven has a capacity of from 6 to 8 tons. The details of the oven mechanism are secret, and the plant is closely guarded. Besides the coke, there are produced gas, ammoniacal liquor, tar, and, subsequently, sulphate of ammonia. As stated, the daily output of gas will be 10,000,000 cubic feet. About 50 per cent. of the gas is used in keeping the temperature of the ovens to the required intensity. Of the balance 4,000,000 cubic feet will be brought to Baltimore each day through a gigantic main to be laid between Sparrows Point and the Consolidated Gas Company's station at Canton. Surveys for the pipe line will be begun in a short while. It will cross several streams and will cost about $500,000. The Gas Company's engineers say that it will be in service a year hence. The gas to be brought from the steel works will be purified and enriched before it is turned into the service mains of the Company. It will be mixed with an equal amount of water gas of high illuminating power. Under normal conditions Baltimore uses about 8,000,000 cubic feet of gas a day. During the coal strike last winter the daily consumption increased to nearly 10,000,000 feet, and the gradual adoption of gas as a fuel for cooking will probably make it tend toward that amount in the future. With the Sparrows Point supply to draw upon, all chances of a gas famine will be removed and the quality of the illuminant will he vastly bettered." Let us hope so.

Mr. Frederick Lewis has been appointed Superintendent of the Rockingham County Light and Power Company, of Portsmouth, N.H.

He was Manager of the General Gas, Electric and Power Company, of Connersville, Ind.

THE Louisville (Ky.) Gas Company will in all probability sell bonds amounting in par value to $400,000, the right to issue which was granted some years ago, but not exercised. The bonds bear 5 per cent. interest. The proceeds will be devoted to the natural gas distributing equipment which the Company proposes to instal.

THE Cape May (N. J.) Illuminating Company has filed a mortgage in the office of the Recorder of Deeds, Camden, N. J., in the sum of $500,000 to secure an issue of a like amount in 5 per cent. gold bonds.

A CORRESPONDENT forwards the following from Buffalo, N. Y., under date of August 31st.: "Messrs. Rogers, Locke & Milburn have filed in the office of the Clerk of Erie county, and with the Clerk of the Court of Appeals of the State of New York as well, the appeal book in the case of the city of Buffalo against the Buffalo Gas Company, which means that the preparation of the Company's appeal to the highest court of the State is now finished and the case is ready to go on the Court of Appeals calendar. As it goes on at the tail end of the calendar, the Corporation Counsel believes it cannot be reached for argument until some time next summer. This is the old case in which Julius S. Smith, of No. 27 Main street, paid some bills that the Company charged him for the use of a meter, as he and the city claim, though the Company, of course, maintains that it was a charge for inspection of meters. Mr. Smith complained to the city about the charge and William H. Cuddeback, who was then (in August, 1901) Corporation Counsel, brought suit against the Company to collect the $50 penalty prescribed for violation of a city ordinance that forbids meter charges. The case was tried before Judge Volger, in November, 1901, who gave judgment against the Company for $50 and costs. The Company appealed to the special term, where Justice White affirmed Judge Volger's decision and tacked on some more costs to the Company's bill. Next the Company appealed to the appellate division, which last March affirmed the decision of the lower courts and still further increased the costs chargeable to the Company. The five justices were divided, Hiscock, Spring and Williams being for affirmation and Nash and McLennan being for reversal of the lower courts' decision. The Company immediately gave notice that it would appeal to the court of last resort and its filing of its case yesterday indicates that it means a fight to the finish. The outcome means much to the Company as well as to the city, for, if the city should succeed, the Company will have to cease its meter inspection charges and may also have to defend hundreds of suits that might be brought by individual citizens to compel the Company to remit sums paid under such charges for the last few years."

MR. L. W. SEARS is informed that the Directors of the Granville (N. Y.) Gas and Electric Company are: F. T. Pember, E. R. Norton, W. J. Gallagher, B. G. Higley, J. B. McCormick, J. E. Norton and N. T. Drake, all residents of Granville.

ON the 3d inst. the shareholders in the Sandusky (O.) Gas and Electric Company voted to issue $100,000 in 6 per cent. cumulative preferred stock. The common stock issue amounts to $500,000 at par.

THE Detroit City Gas Company will likely extend its pipes to Hamtramck, provided the authorities of that village will issue a franchise that is fair to both sides.

THE voters of Salem, Ore., as the result of a special election, have authorized the authorities to construct a gas plant to be operated on municipal account.

THE Massachusetts Board of Gas and Electric Light Commissioners has named the 23d inst. as the day on which the public hearing for an order to reduce the selling rates charged by the Marlboro Gas Company will be held.

THE San Francisco *Bulletin* of August 26th said: "The San Francisco Gas and Electric Company will issue bonds in the sum of $10,000,000 as soon as the legal details of the gas deal of last week are completed. The money will be used to pay for the Companies bought out by the San Francisco Gas and Electric Company, which include the two Companies of Claus Spreckels, who will receive $5,000,000 worth of the bonds. He has been paid already a large sum in cash. A part of the sum raised by the bond issue will be used by the Company for extensive improvements which are needed. About $2,000,000 will be expended in this manner. The bonds will be a first mortgage on all the combined property. Lawyers are finishing up the details of the deal, one of which is the absorption of $3,500,000 of the Pacific Gas Improvement Company's stock. William Bourn and Captain Payson will continue as President and Vice-President of the Company. It is said I. W. Hellman, of the Nevada Bank, and Robert Watt will be chosen Directors in the Company."

THE additions to the buildings and manufacturing plant of the Brockton (Mass.) Gas Company will be completed by December 1st.

"R. S. W." is informed that the annual meeting of the St. Joseph (Mo.) Gas Company will be held in its offices in St. Joseph, the morning of Wednesday, September 16th.

THE gas and electric lighting plants of the Belfast (Me.) Light and Power Company have been purchased by a Boston syndicate, the nominal head thereof being Mr. N. Curtis Fletcher.

THE Stacey Mfg. Company, of Cincinnati, O., has been awarded the contract for the construction of a storage holder on the plant of the Dixon (Ills.) Gas Company.

THE following notice was recently issued by Mr. John L. Reifsnider, President of the Westminster (Md.) Gas Light Company, to the residents of that city: "Believing that gas is not only the most satisfactory product for fuel, especially in the summertime, but that as an illuminant it can be furnished cheaper, more reliable than electricity; and having just installed new machinery to practically double the capacity of the plant; and following the custom of the Company to endeavor to furnish at all times the most light for the least money, the Westminster Gas Light Company has decided to reduce the price of gas to its customers, making the basic rate $1.50 per 1,000 feet, with a sliding scale down to $1.25. This reduction to take effect from and after the 19th of August, 1903, the discount to apply only when the gas is paid for promptly. Information regarding gas stoves, water heaters, house piping, etc., with prices of same furnished at office of the Company. Gas ranges set free."

MR. JOHN H. CUNNINGHAM, Secretary and Treasurer of the Company, in forwarding the above, said: "This marks the fifth reduction made by our Company, from $4—the first price—to the present schedule of $1.50 to $1.25; and we have never found it necessary to at any time increase it. Each reduction has been followed by satisfactory increase in consumption; for the last 3 years our average increase has been 25 per cent. We confidently expect the next year to make exceptional strides, not only on account of our reduction but also because the local electric company has just increased its rate to consumers, rendered necessary it is said through the increase in price of coal."

"SOME evenings ago, at a special town meeting of the ratepayers of Reading, Mass., the gas question was submitted for consideration. After 2 hours of lively discussion it was voted to refer the whole matter to a committee for further investigation, the committee to report its findings in 90 days. The question for the committee to decide is: Would it be best for the town to buy of the Peoples Gas and Electric Company, of Stoneham, that part of its plant and franchise which said Company claims to have in the town, or to grant said Company permission to extend its gas pipes in the streets of Reading for the distribution and sale of gas to the public? The sense of the meeting was for municipal ownership, but it was deemed best, before a vote on the subject was taken, to have the matter thoroughly investigated. W. S. Kinsley, Chairman of the Municipal Light Board, opposed the purchase of the present mains from the Peoples Gas and Electric Company, regarding them of little value, except temporarily. Any increase in the number of consumers such as may reasonably be expected will find them inadequate, he said, and it would be neceseary in a short time to parallel or replace them with new and larger mains. Mr. Kinsley argued strongly in favor municipal ownership, saying the wisest thing to do would be to put in pipes, which could be easily done for the price the town would be obliged to pay for the old ones. If this was done the town could purchase gas from Wakefield, or be at liberty at any time to build a plant of its own.—K. R. S."

THE Newport News (Va.) Company reports the placing of a good round number of gas ranges and other modern gas using appliances this summer. The Company has materially extended its main system.

MR. M. I. SPARKS has resigned the position of Manager of the Santa Fe (New Mexico) Water and Light Company. His temporary successor is Mr. W. H. Fritchman.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 42 Pine Street, New York.
Telephone, 2996 John.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.

NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, SEPTEMBER 7, 1903.

The Market for Gas Securities.

The smoke of contentment does not seem to be emerging from the chimneys of the houses in which dwell the local financial magnates, wherefore those who stand waiting for the sign of peace are sorely perturbed. In times of distress all indications that in times of plenty betoken confidence and safety may not be accepted as pointing the way. Distrust and curtailment are the ruling factors in the general stock market, and as the main body goes so must the lesser factors. Consolidated closed today (Friday) at 174¼—this quotation, of course, being "ex." anything considering dividend and rights belonging to it. The "rights" are to be exercised next Wednesday, and the men behind the guns are even now congratulating themselves on the directness of their aim. In other words, the right to take in the proportionate stock to each shareholder at 150 has not been rightly comprehended by the rank and file.

It is amusing to note the efforts of the "gunners" to dislodge the scattering lots of Mutual that are owned by "outsiders," but the shooting seems to little purpose. Our nominal quotation of to-day for Mutual is not within 100 points of its real value. Our advice, which has been pitched to the one key for many months is, if you wish to deal, buy rather than sell anything in the accredited line of gas shares the country over. It is worthy of note that Peoples, of Chicago, keeps well in the wind. A certain coterie in that breezy city will, before the snow flies, wish that their short lines were smaller.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

SEPTEMBER 7.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	174	174¼
Central Union, Bonds, 5's.	3,000,000	1,000	105	108
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	658,000	.	108	112
Mutual	3,500,000	100	280	295
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. Bonds, 5's	11,000,000	1,000	102	106
Northern Union, Bonds, 5's.	1,250,000	1,000	105	106½
New York and East River Bonds 1st 5's	3,500,000	1,000	102	106
" 1st Con. 5's	1,500,000		109	111
Standard	5,000,000	100	135	140
Preferred	5,000,000	100	155	170
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	185	200
" " Bonds (5's)	15 000,000	1,000	119	119½
Bay State	50,000,000	50	⅛	¼
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	4	5
" " Bonds, 5's	5,254,000	1,000	73	76
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150.000	1,000	..	..
Central, San Francisco	1,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,050,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	94½	95
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¼	89¼
Preferred	3,026,500	100	107½	109
Consumers, Jersey City Bonds	600,000	1,000	100	102
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	65	65¼
Mortgage, 6's	3,600,000	..	..	115
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	85	87
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	87	95
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	851,000	1,000	77	79
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	..	65
" Bonds, 6's	2,650,000	..	104¾	106
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	79	90
Preferred	2,500,000	100	85½	..
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,001	1,000	60	65
Louisville	2,570,000	50	136	140
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co	6,000,000	..	56	58
Bonds, 6's	4,600,000	.	105	105¾
New Haven	1,000,000	25	300	325
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	94½	94½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	0,000,000	100	..	..
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	95	96½
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	46	48
Bonds	2,047,000	1,000	98½	99½
Washington, D. C	2,600,000	20	298	305
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	109½	110
Wilmington, Del	600,000	50	232	..

Advertisers' Index.

GAS ENGINEERS. Page

A. E. Boardman, New York City ... 392
Baxter & Young, Detroit, Mich ... 392
B. E. Chollar, St. Louis, Mo ... 382
David Leavitt Hough, New York City ... 392
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 384
Frank D. Moses, Trenton, N. J ... 378
Fred. Bredel Co., Milwaukee, Wis ... 380
Geo. R. Rowland, New York City ... 382
Humphreys & Glasgow, New York City ... 393
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 392
The Gas Machinery Co., Cleveland, O ... 379
The Jeffrey Manufacturing Co., Columbus, O ... 376
The Western Gas Construction Co., Fort Wayne, Ind ... 400
Wm. Henry White, New York City ... 395

GAS WORKS APPARATUS AND CONSTRUCTION.

A. E. Boardman, New York City ... 392
Bartlett, Hayward & Co., Baltimore, Md ... 393
Baxter & Young, Detroit, Mich ... 392
Christopher Cunningham, Brooklyn, N.Y ... 389
Connelly Iron Sponge and Governor Co., New York City 383
Continental Iron Works, Brooklyn, N. Y ... 394
Cruse-Kemper Co., Philadelphia, Pa ... 379
Davis and Farnum Mfg. Co., Waltham, Mass ... 392
Delly & Fowler, Philadelphia, Pa ... 396
Economical Gas Apparatus Construct'n Co., Toronto, Ont 384
Frank D. Moses, Trenton, N. J ... 378
Fred. Bredel Co., Milwaukee, Wis ... 380
G. Shepard Page's Sons, New York City ... 392
Humphreys & Glasgow, New York City ... 393
Isbell-Porter Company, New York City ... 394
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 392
Lloyd Construction Co., Detroit, Mich ... 382
Logan Iron Works, Brooklyn, N. Y ... 396
Quintard Iron Works, New York City ... 393
R. D. Wood & Co., Philadelphia, Pa ... 394
Riter-Conley Mfg. Co., Pittsburg, Pa ... 395
Stacey Mfg. Co., Cincinnati, O ... 395
The Connersville Blower Company, Connersville, Ind ... 397
The Gas Machinery Co., Cleveland, O ... 379
The Jeffrey Manufacturing Co., Columbus, O ... 376
The Western Gas Construction Co., Fort Wayne, Ind ... 400
United Gas Improvement Co., Philadelphia, Pa ... 387

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md ... 393
B. E. Chollar, St. Louis, Mo ... 382
Economical Gas Apparatus Construct'n Co, Toronto, Ont. 394
Humphreys & Glasgow, New York City ... 393
The Gas Machinery Co., Cleveland, O ... 379
The Western Gas Construction Co., Fort Wayne, Ind ... 400
United Gas Improvement Co., Philadelphia, Pa ... 387

SCRUBBERS AND CONDENSERS.

Continental Iron Works, Brooklyn, N.Y ... 394
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 392
Logan Iron Works, Brooklyn, N. Y ... 396
R. D. Wood & Co., Philadelphia, Pa ... 394
Riter-Conley Mfg. Co., Pittsburg, Pa ... 395
Stacey Mfg. Co., Cincinnati, O ... 395
The Gas Machinery Co., Cleveland, O ... 379
The Western Gas Construction Co., Fort Wayne, Ind ... 400

PRODUCER POWER PLANTS.

R. D. Wood & Co., Philadelphia, Pa ... 394

TAR AND CARBONIC ACID EXTRACTOR.
Stacey Mfg. Co., Cincinnati, O..... 395
The Gas Machinery Co., Cleveland, O..... 379
The Western Gas Construction Co., Fort Wayne, Ind... 400

AMMONIA CONCENTRATORS.
Michigan Ammonia Works, Detroit, Mich..... 376
The Gas Machinery Co., Cleveland, O..... 379
The Western Gas Construction Co., Fort Wayne, Ind... 400

GAS METERS.
American Meter Co., New York and Philadelphia..... 399
Detroit Meter Company, Detroit, Mich..... 399
D. McDonald & Co., Albany, N.Y..... 397
Helme & McIlhenny, Philadelphia, Pa..... 399
John J. Griffin & Co., Philadelphia, Pa..... 360
Keystone Meter Co., Royersford, Pa..... 398
Maryland Meter and Mfg. Co., Baltimore, Md..... 398
Metric Metal Co., Erie, Pa..... 399
Nathaniel Tufts Meter Co., Boston, Mass..... 398

PREPAYMENT METERS.
American Meter Co., New York and Philadelphia..... 399
D. McDonald & Co., Albany, N. Y..... 397
Helme & McIlhenny, Philadelphia, Pa..... 399
John J. Griffin & Co., Philadelphia, Pa..... 360
Keystone Meter Co., Royersford, Pa..... 398
Nathaniel Tufts Meter Co., Boston, Mass..... 398

PREPAYMENT METER ATTACHMENTS.
Reeves Mfg. Co., New Haven, Conn..... 380

GAS AND WATER PIPES.
Charles Millar & Son Co., Utica, N. Y..... 384
Christopher Cunningham, Brooklyn, N.Y..... 389
Davis & Farnum Mfg. Co., Waltham, Mass..... 392
Donaldson Iron Co., Emaus, Pa..... 384
M. J. Drummond & Co., New York City..... 384
R. D. Wood & Co., Philadelphia, Pa..... 394
Warren Foundry and Machine Co., New York City..... 384

NON-RUSTING PIPE LUBRICANT.
Alan H. Tripp, Chicago, Ills..... 376

GAS COALS.
Berwind-White Coal Mining Co., New York and Phila. 390
Perkins & Co., New York City..... 390
Westmoreland Coal Co., Philadelphia, Pa..... 391

SPECIALTIES FOR OIL AND PIPE LINES.
S. R. Dresser, Bradford, Pa..... 381

GAS MAIN STOPPERS.
Safety Gas Main Stopper Co., N.Y. City..... 384

GAS TAPPING MACHINES.
George Light, Dayton, O..... 384
H. Mueller Manufacturing Company, Decatur, Ills..... 381

CANNEL COALS.
Perkins & Co., New York City..... 390

STOKING MACHINERY.
G. A. Bronder, New York City..... 389

AUTOMATIC WEIGHING MACHINERY.
Richardson Scale Co., New York City..... 389

CONVEYORS.
C. W. Hunt Company, New York City..... 381
G. A. Bronder, New York City..... 389
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 392
The Gas Machinery Co., Cleveland, O..... 379
The Jeffrey Manufacturing Co., Columbus, O..... 376
The Link-Belt Machinery Co., Chicago, Ills..... 391
The Western Gas Construction Co., Fort Wayne, Ind... 400

CHARGING BARROWS & COAL WAGONS.
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 392
Stacey Mfg. Co., Cincinnati, O..... 395

GAS ENRICHERS.
Standard Oil Co., New York City..... 391
The Sun Oil Co., Pittsburg, Pa..... 391

COKE CRUSHERS.
C. M. Keller, Columbus, Ind..... 391
The Jeffrey Manufacturing Co., Columbus, O..... 376

STEAM BLOWER FOR BURNING BREEZE.
The Connersville Blower Company, Connersville, Ind... 397

ECONOMIZERS.
Green Fuel Economizer Co., Matteawan, N.Y..... 382

GAS GAUGES.
The Bristol Co., Waterbury, Conn..... 376

GAS GOVERNORS.
Connelly Iron Sponge and Governor Co., NewYork City 383
Isbell-Porter Co., New York City..... 394
R. D. Wood & Co., Philadelphia, Pa..... 394

CEMENTS.
C. L. Gerould, Galesburg, Ills..... 398

RETORTS AND FIREBRICKS.
Adam Weber Sons, New York City..... 388
Baltimore Retort and Firebrick Co., Baltimore, Md..... 389
Brooklyn Firebrick Works, Brooklyn, N. Y..... 388
Henry Maurer & Son, New York City..... 388
James Gardner, Jr., Co., Pittsburg, Pa..... 388
J. H. Gautier & Co., Jersey City, N. J..... 388
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 388
Missouri Firebrick Co., St. Louis, Mo..... 388
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 378
The Kreischer Brick Mfg. Co., New York City..... 388

INCLINED RETORTS.
Adam Weber Sons (Graham, Morton [England] System) 388
Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 383
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 378

VERTICAL S'S.
Adam Weber Sons (Oscar B. Weber's Construction)..... 388
Connelly Iron Sponge & Gov. Co. (Drake's [Eng.] System) 383
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 378

REGENERATIVE FURNACES.
Adam Weber Sons, New York City..... 388
Bartlett, Hayward & Co., Baltimore, Md..... 393
Fred. Bredel Co., Milwaukee, Wis..... 380
J. H. Gautier & Co., Jersey City, N.J..... 388
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 388
Missouri Firebrick Co., St. Louis, Mo..... 388
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 378

SELF-SEALING MOUTHPIECE DOORS.
Continental Iron Works, Brooklyn, N.Y..... 394
Isbell-Porter Co., New York City..... 394
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 392
Logan Iron Works, Brooklyn, N.Y..... 396
R. D. Wood & Co., Philadelphia, Pa..... 394
Stacey Mfg. Co., Cincinnati, O..... 395
The Gas Machinery Co., Cleveland, O..... 379
The Western Gas Construction Co., Fort Wayne, Ind... 400

CHIMNEY CONSTRUCTION.
Adam Weber Sons, New York City..... 388

INCANDESCENT GAS LAMPS.
Ball Check Light Co., New York City..... 378
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 380
Lindsay & Co., Chicago, Ills..... 377
Welsbach Company, Gloucester, N. J..... 386

BURNERS.
C. A. Gefrorer, Philadelphia, Pa..... 380
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 380
Wm. M. Crane Co., New York City..... 381

LAVA GAS TIPS.
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 380

(*Continued on page* 376.)

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(*Concluded from page* 375.)

STREET LAMPS.

Thos. T. W. Miner, New York City 381
Welsbach Street Lighting Co., New York and Phila.... 379

PURIFIERS.

Connelly Iron Sponge and Governor Co., New York City. 383
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 392
R. D. Wood & Co., Philadelphia, Pa..... 394
Stacey Mfg. Co., Cincinnati, O..... 395
The Western Gas Construction Co., Fort Wayne, Ind... 400

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 383

VALVES.

Continental Iron Works, Brooklyn, N. Y..... 394
Isbell-Porter Co., New York City..... 394
Kerr Murray Mfg. Co., Fort Wayne, Ind 392
Ludlow Valve Manufacturing Co., Troy, N.Y..... 381
R. D. Wood & Co., Philadelphia, Pa..... 394
Stacey Mfg. Co., Cincinnati, O..... 395
The P. H. & F. M. Roots Co., Connersville, Ind..... 343
The Western Gas Construction Co., Fort Wayne, Ind.... 400

EXHAUSTERS.

Connelly Iron Sponge and Governor Co., New York City 383
Isbell-Porter Company, New York City..... 394
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 392
The Connersville Blower Company, Connersville, Ind... 393
The P. H. & F. M. Roots Co., Connersville, Ind..... 343

ELECTRICAL APPARATUS.

Wm. Henry White, New York City..... 395

PURIFIER SCREENS.

John Cabot, New York City..... 380

GAS STOVES.

American Meter Co., New York and Philadelphia..... 385
Keystone Meter Co., Royersford, Pa..... 398
Maryland Meter and Manufacturing Co., Baltimore, Md. 398
Nathaniel Tufts Meter Co., Boston Mass..... 398

HOT WATER HEATERS.

The Humphrey Mfg. and Plating Co., Kalamazoo, Mich. 384

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N.Y..... 382

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 393
Continental Iron Works, Brooklyn, N.Y..... 394
Cruse-Kemper Co., Philadelphia, Pa. 379
Davis & Farnum Mfg. Co., Waltham, Mass..... 392
Deily & Fowler, Philadelphia, Pa..... 336
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 392
Logan Iron Works, Brooklyn, N Y..... 396
R. D. Wood & Co., Philadelphia, Pa..... 394
Riter-Conley Mfg. Co., Pittsburg, Pa..... 395
Stacey Mfg. Co., Cincinnati, O..... 395

STORAGE TANKS.

Christopher Cunningham, Brooklyn, N.Y..... 389
Stacey Mfg. Co., Cincinnati, O..... 395

AUTOMATIC SCALES.

Richardson Scale Co., New York City..... 380

INVESTORS.

W. R. Faben Construction Company, Toledo, O..... 380

PATENTS, TRADE-MARKS, COPYRIGHTS.

Royal E. Burnham, Washington, D. C..... 380

BOOKS, ETC.

Practical Handbook on Gas Engines 378
Hughes' "Gas Works"..... 378
Electric Gas Lighting..... 376
Coal Tar and Ammonia..... 380
Gas Analyst's Manual 396
Field's Analysis, 1902 338
Gas Flow Computers..... 391
Excerpts from Reports of Gas Commissioners..... 379
Directory of Gas Companies..... 395
Gas Engineer's Laboratory Handbook 391
Gas Engineer's Pocket-Book..... 390
Poole on Fuels 390
Binders..... 391

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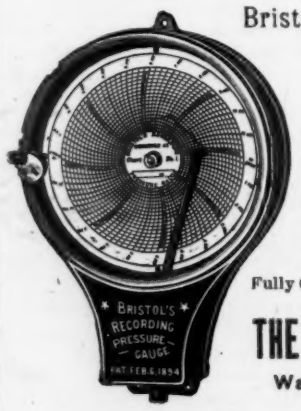

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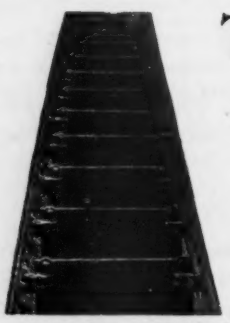

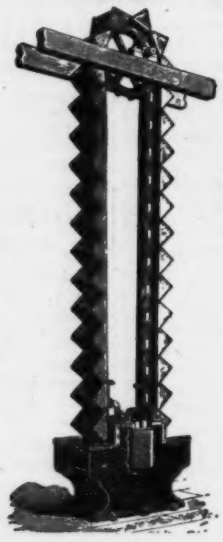

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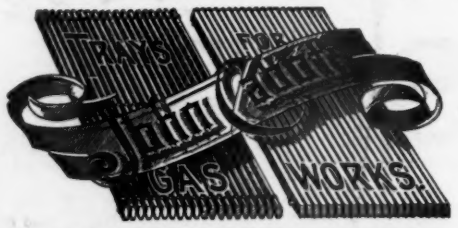

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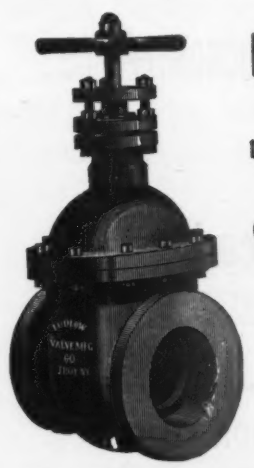

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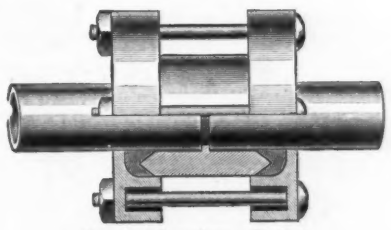
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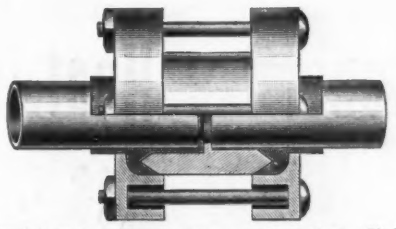
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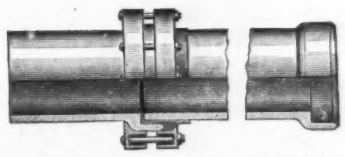
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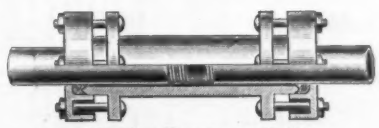
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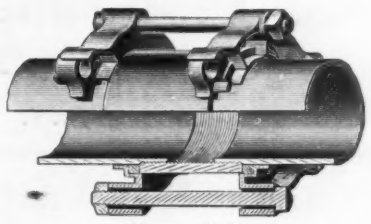
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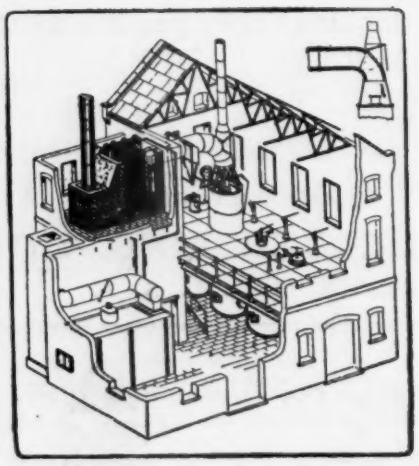

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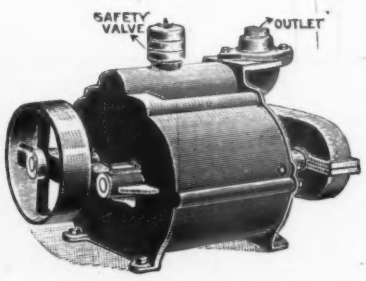

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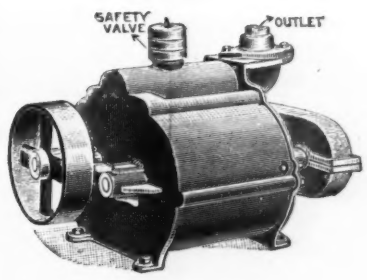

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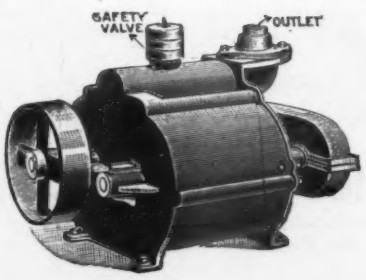

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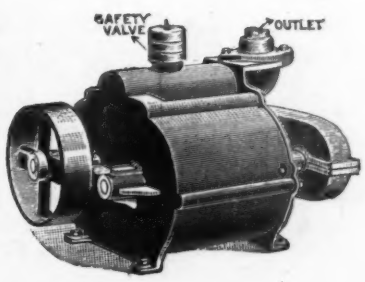

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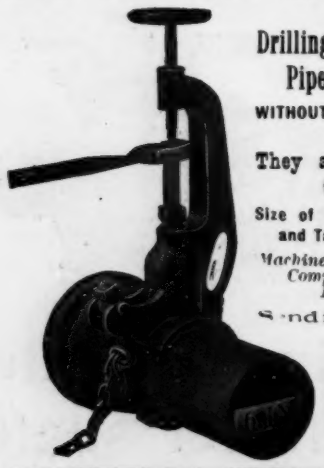

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They are Strong and Compact.

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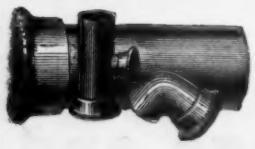

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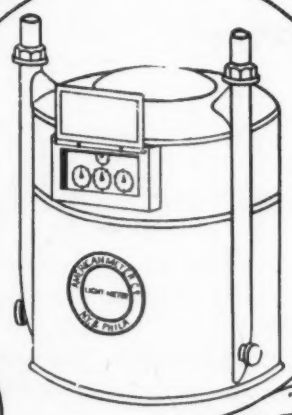
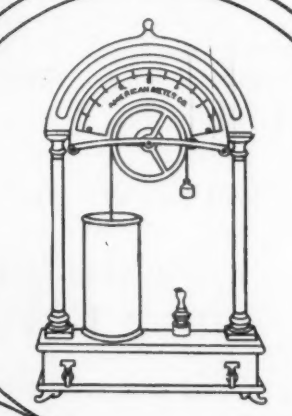
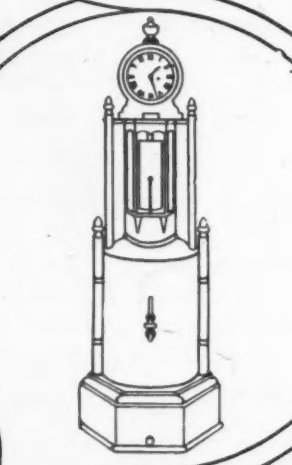
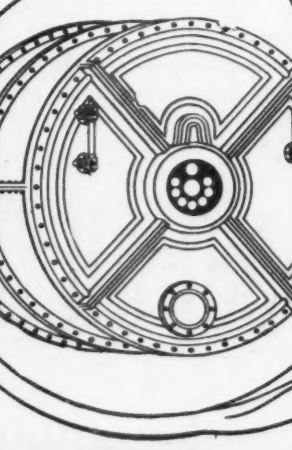




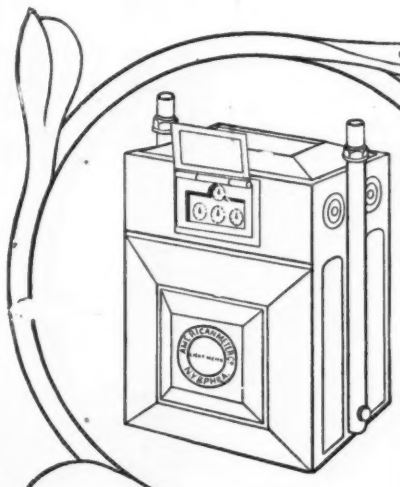


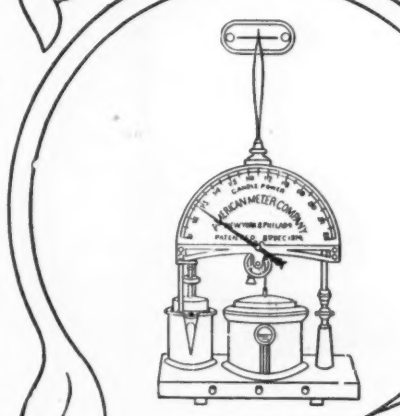


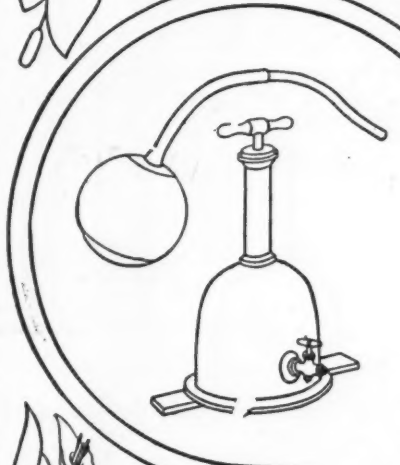
PUBLIC LIGHTING TABLE.

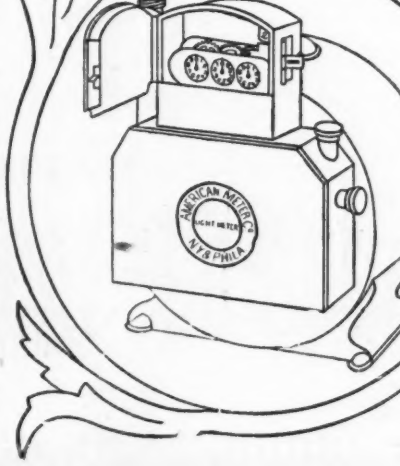
SEPTEMBER, 1903.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Extinguish	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	12.30 AM	4.30 AM	6.30	4.20
Wed.	2	1.20	4.30	6.30	4.20
Thu.	3	2.10	4.30	6.15	4.30
Fri.	4	3.10	4.30	6.15	4.30
Sat.	5	No L.	No L.	6.15	4.30
Sun.	6	No L. FM	No L.	6.15	4.30
Mon.	7	No L.	No L.	6.15	4.30
Tue.	8	6.50 PM	8.10 PM	6.15	4.30
Wed.	9	6.50	8.40	6.15	4.30
Thu.	10	6.50	9.20	6.05	4.40
Fri.	11	6.50	10.00	6.05	4.40
Sat.	12	6.50	10.40	6.05	4.40
Sun.	13	6.40	11.30	6.05	4.40
Mon.	14	6.40 LQ	12.20 AM	6.05	4.40
Tue.	15	6.40	1.20	6.05	4.40
Wed.	16	6.40	2.30	6.05	4.40
Thu.	17	6.40	4.40	5.55	4.50
Fri.	18	6.40	4.40	5.55	4.50
Sat.	19	6.40	4.40	5.55	4.50
Sun.	20	6.30 NM	4.50	5.55	4.50
Mon.	21	6.30	4.50	5.55	4.50
Tue.	22	6.30	4.50	5.55	4.50
Wed.	23	6.30	4.50	5.55	4.50
Thu.	24	6.30	4.50	5.40	5.00
Fri.	25	8.00	4.50	5.40	5.00
Sat.	26	8.40	4.50	5.40	5.00
Sun.	27	9.30	4.50	5.40	5.00
Mon.	28	10.20 FQ	4.50	5.40	5.00
Tue.	29	11.10	4.50	5.40	5.00
Wed.	30	12.10 AM	4.50	5.40	5.00









TOTAL HOURS LIGHTING DURING 1903.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	245.00	January	423.20
February	192.00	February	355.25
March	201.00	March	355.35
April	167.20	April	298.50
May	152.00	May	264.50
June	131.00	June	234.25
July	140.40	July	243.45
August	156.20	August	280.25
September	171.20	September	321.15
October	198.20	October	374.30
November	216.30	November	401.40
December	232.10	December	433.45
Total, yr.	2203.40	Total, yr.	3987.45

No. 904 Welsbach Outdoor Arc

Furnished with 2, 3, 4 or 5 Burners

This Lamp is Built to Stand

rough usage and severe weather conditions. In mechanical construction and workmanship it is perfect.

The material is of the best. All exposed metal parts made of cold rolled sheet copper.

Guaranteed Positively

Rain=proof

Wind=proof

Insect=proof

The main cock lights one or all burners. Pilot flash light.

18-inch enameled steel reflector shade.

Long tube burners, with adjustable needle gas feed, permit use of either 3½-inch or 4½-inch mantles.

Renewal of Mantle

made easy and without danger of breakage by raising the body of the lamp on main stem. The neck of the globe thus acts as a wind guard, protecting the other mantles from damage by weather conditions.

Candle Power Test

of 4-burner lamp:

With 3½-inch mantles, 412-candle power.

With 4½-inch mantles, 503-candle power.

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Sample Case of 3, 6 or 12 lamps sent on 30 days' approval at prices based on 100 lamps.

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Baltimore, Md.	Hempstead, N. Y.	Dover, Del.
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Amesbury, Mass.	Lynn, Mass.	Savannah, Ga.
Aberdeen, S. D.	Newark, N. J.	New York (Central Union Co.)
Winsted, Conn.	Washington, D. C.	Cicero, Ills.
Canon City, Col.	Boone, Ia.	Chicago (Ogden Co.)
Schenectady, N. Y.	Pueblo, Col.	Easton, Pa.
Hagerstown, Md.	Charlotte, N. C.	Lawrence, Mass.
Malden, Mass.	Fall River, Mass.	Council Bluffs, Ia.
Bridgeport, Conn.	Duluth, Minn.	Chattanooga, Tenn.
Albert Lea, Minn.	New York (Mutual Co.)	

TOTAL SETS TO JULY 1, 1903, ... 51
TOTAL DAILY CAPACITY, ... 55,150,000 cubic feet.
TOTAL SETS TO DATE, ... 498
TOTAL DAILY CAPACITY, ... 354,830,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
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Fire Brick, Tiles, Etc.

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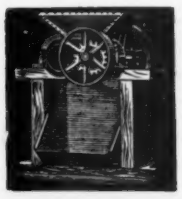

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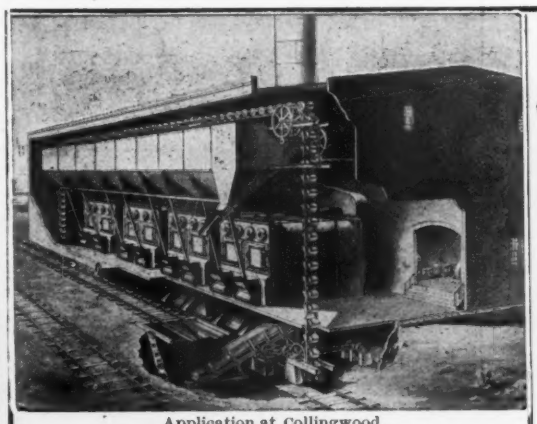

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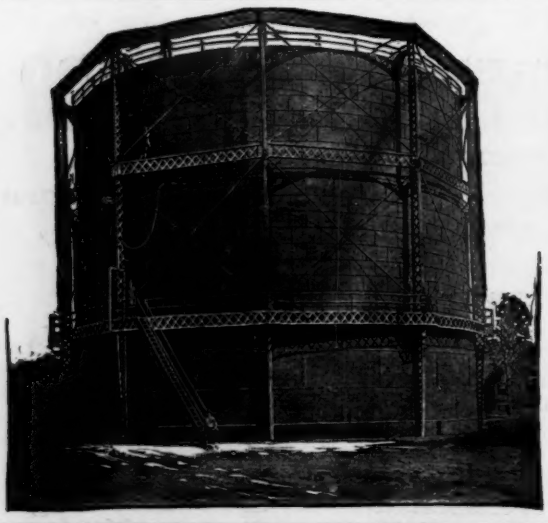

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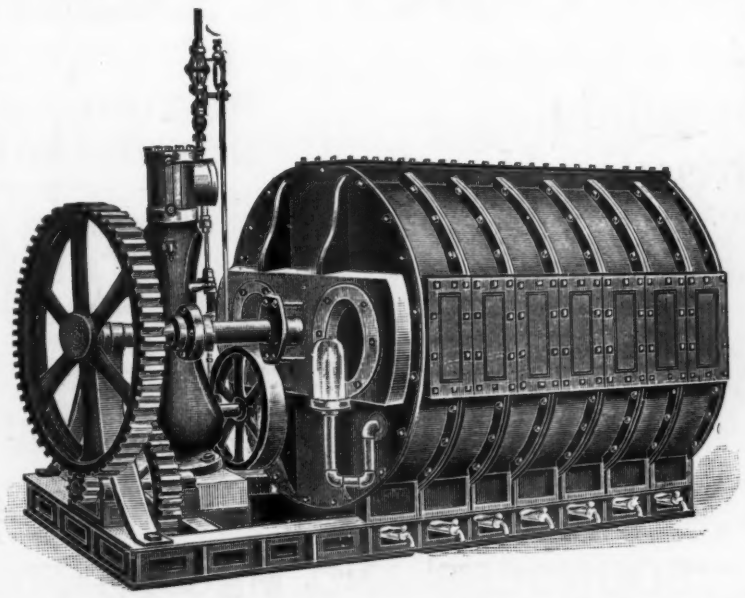

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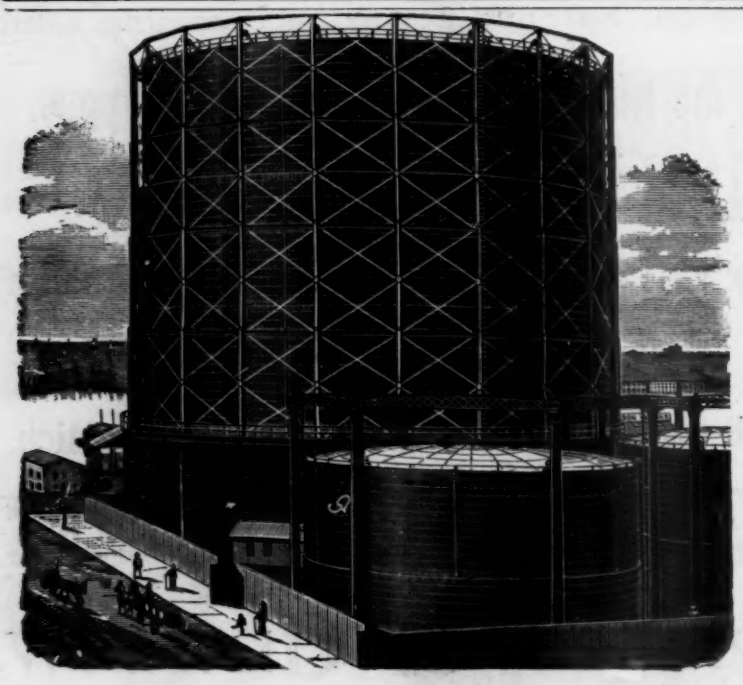

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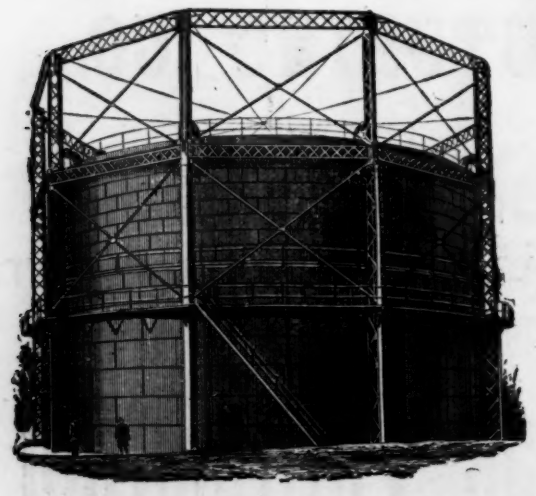

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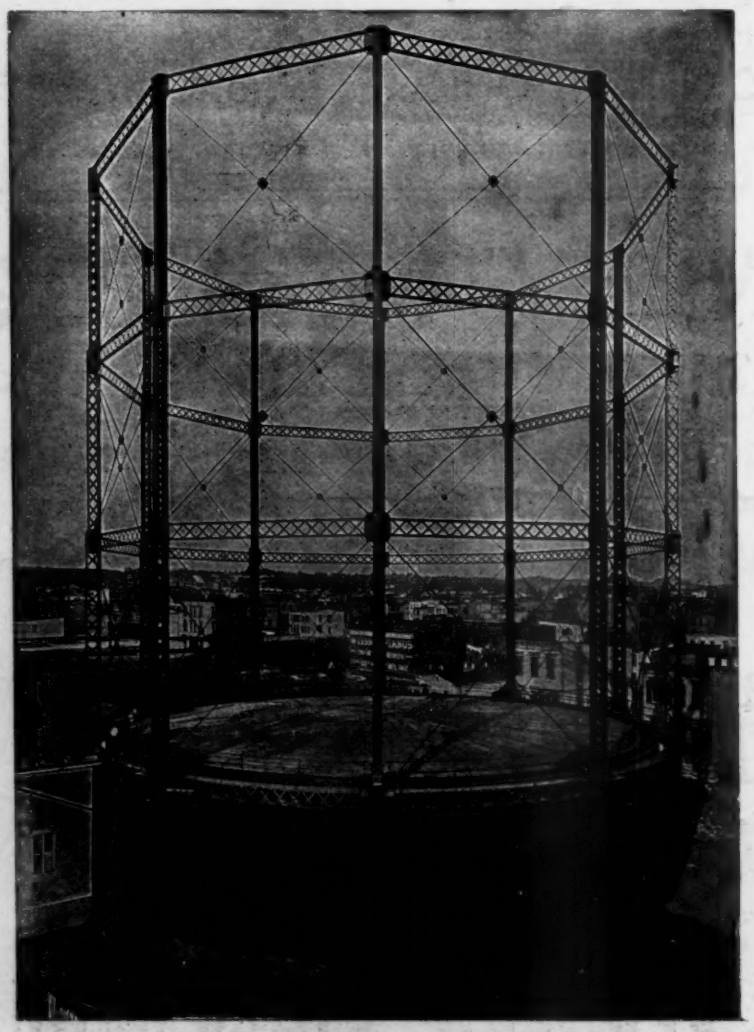

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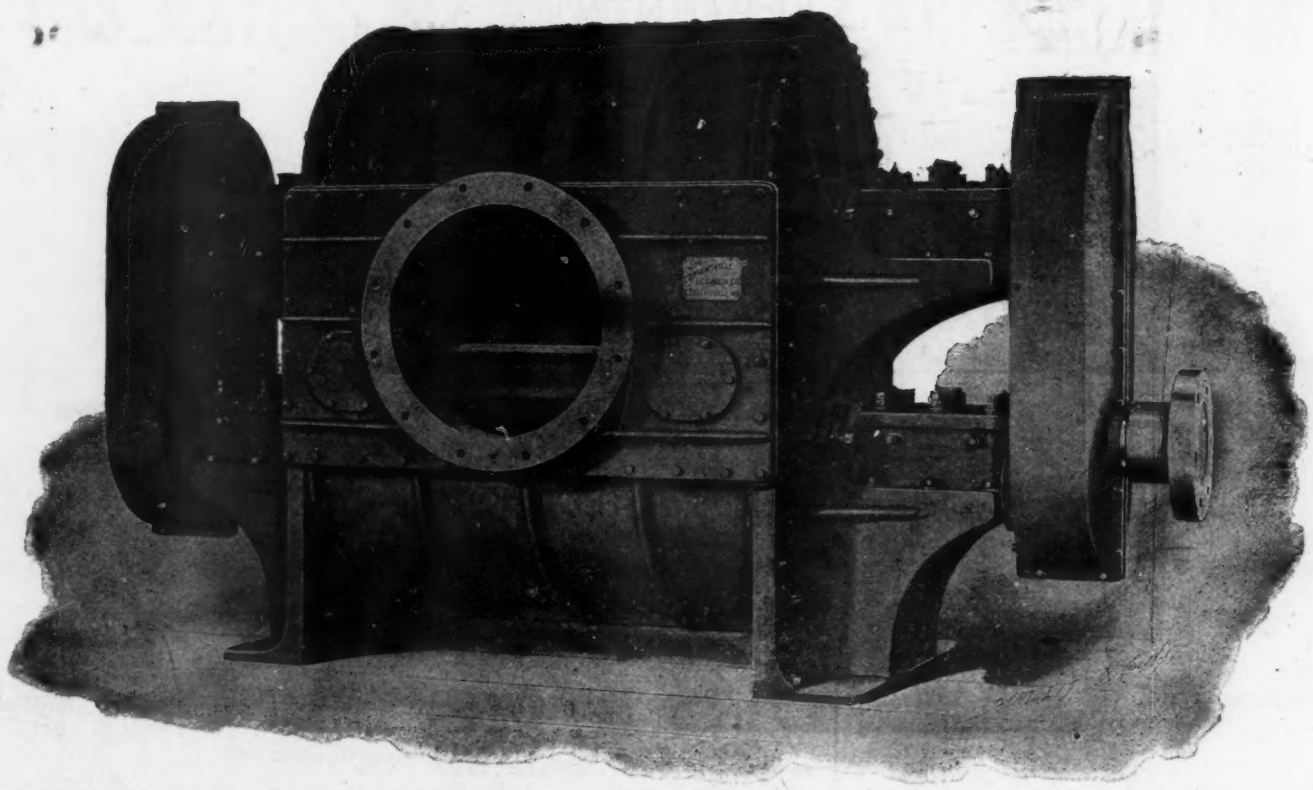

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